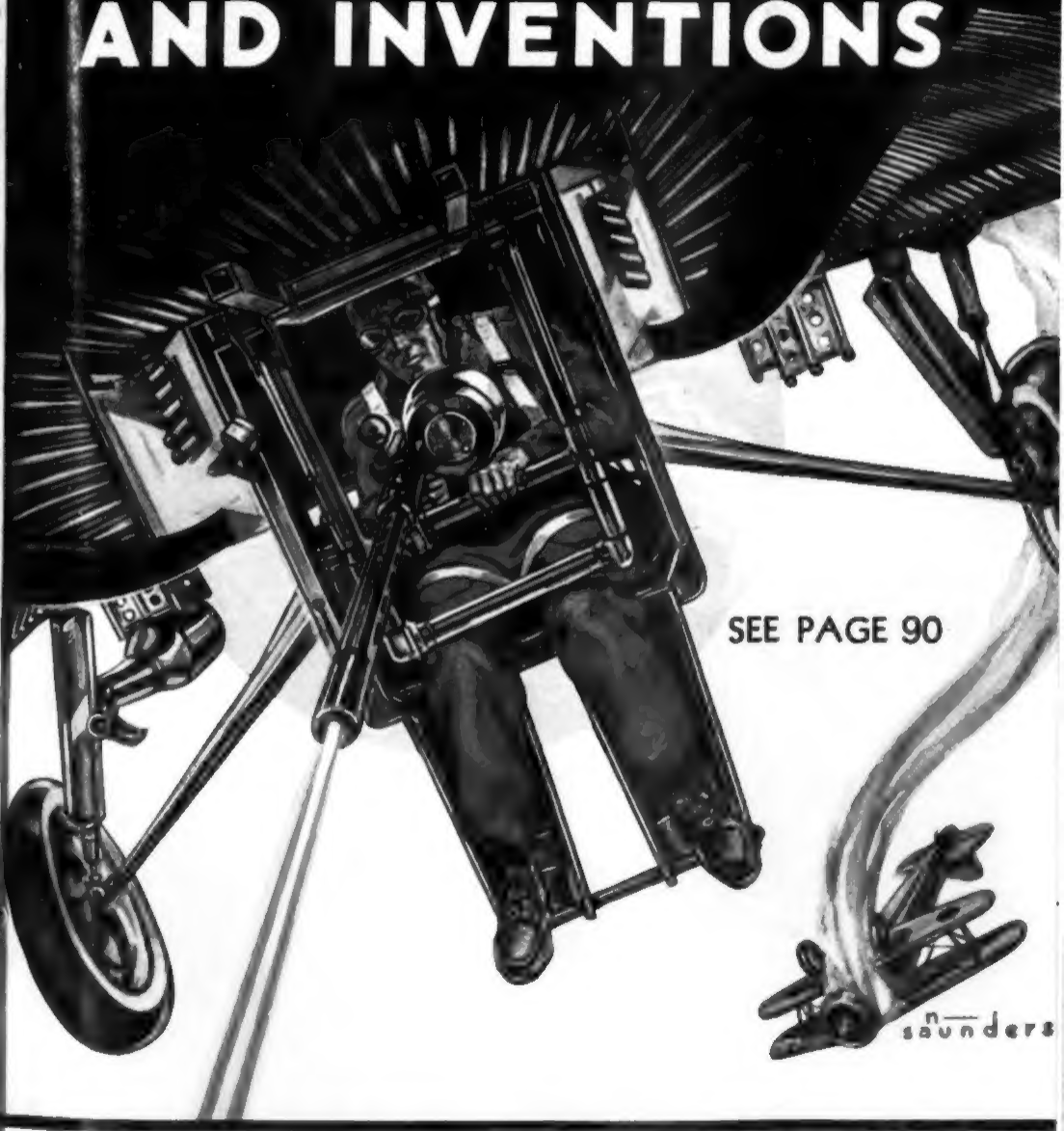
A FAWCETT PUBLICATION

SEPT. 25c
IN CANADA 30c

MODERN MECHANIX AND INVENTIONS



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Thrills of Balloon Racing – Houses that Hang From a Pole
Picking Army Flyers – Steam Cars – Ideas for Inventors

How Would $3,500.00 CASH Help You RIGHT NOW?... *Why?*

Would it Eliminate Money Worries . . . Pay Pressing Bills?

I WILL PAY $250

For the Winning Answer to this Question

I am going to give $3,500.00 to some deserving man or woman who answers my announcements. *You may be the one to get it!* But, before I give it to anyone I would like to know how this big sum of money will help you right now IF I GIVE IT TO YOU! Just answer this question—tell me in a sentence of 20 words or less, and in your own way, how $3,500.00 cash would help you right now—*nothing more to do toward the $250.00 cash prize!* Sounds easy? It is easy! The first answer that comes to your mind may win the prize. No selling—no soliciting. There are no strings at all to this amazing prize offer of $250.00 cash. ALL persons 16 years of age or older owe it to themselves to enter this contest.

20 SIMPLE WORDS WIN $250.00 FOR SOMEONE, MAYBE YOU!

Nothing More for You to Do!

$250 Prize given just for the winning answer to my question

There is no way you can lose. Simply tell me how $3,500.00 would help you right now, if I give it to you. The prize for the winning answer is $250.00, with an added $100.00 for promptness.

The mere fact of sending in a few words for this big $250 cash prize qualifies you for the greater opportunity to

WIN $3,500 CASH

Or a Studebaker-8 Sedan and $2,000 Cash

This huge prize is extra and separate from the cash prize offered for the best answer to my question in only 20 words or less. No wonder we say that here's your opportunity to win a fortune. Just imagine! $3,500.00 cash besides . . . all coming to you at once. Think! How would $3,500.00 cash help you right now? Would it help you start a business of your own, pay off a mortgage on your home, buy new furniture or clothes? Maybe it would help you get an education. Consider all these things you could do with such a huge sum. Plan now—then write your answer—rush it to me at once. Yours may easily be the winner. All replies become the property of Richard Day, Manager.

BE PROMPT! I Will Send You a $100.00 Cash Certificate AT ONCE!

To make it worth your while to be prompt in sending in your answer to my question, "How would $3,500.00 Cash help you RIGHT NOW?"—if you will see that your letter is postmarked not more than three days after you read this offer I will send you a Cash Promptness Certificate entitling you to an extra $100.00 in cash should your reply, in the opinion of the judges, win the $250.00 cash prize offered above, making a cash prize of $350.00 in all.

Hundreds have won

Throughout the past year we have given financial help to hundreds of deserving people in all parts of the United States . . . we have given away hundreds and thousands of dollars in prizes. Beemer won $4,700. Harriet Robertson won $1,100. Hundreds more made happy with huge prizes and cash awards. Now is YOUR opportunity—ACT TODAY!

Rules

Only one answer accepted from a family. Use your own name. $250.00 given for best answer to "How Would $3,500.00 Cash Help You Right NOW?" Answers must be postmarked not later than October 1, 1932. Judges will consider answer only for practical value of the idea, construction and spelling. Neatness or ingenuity of submitting answer not considered. Duplicate prizes will be given in cases of duplicate winning answers.

RICHARD DAY, Manager
909 Cheapside, Dept. W-53R, Cincinnati, Ohio

Just Sending Answer Qualifies You for Opportunity to Win $3,500.00

Some say I am wrong. They say that giving money to people will not help to bring back prosperity. They say that the people who get money from me will spend it foolishly. Now I want to find out. I am going to give away $6,000.00. Someone is going to get $3,500.00, all cash. If I gave you the $3,500.00 what would YOU do with it? Tell me in 20 words or less. Just sending an answer qualifies you for the opportunity to win $3,500.00. If you are prompt I'll send you a $100.00 Cash Certificate AT ONCE! Here is an opportunity of a lifetime. Costs you nothing to win. Rush your answer today. Send no money—just tell me how $3,500.00 would help you right now—if I gave you the $3,500.00 that I have promised to give to some yet unknown deserving person.

Richard Day

Use Coupon or Write Letter with Your Answer

$250.00 PRIZE COUPON

RICHARD DAY, Manager
909 Cheapside, Dept. W-53 R, Cincinnati, Ohio

Here's how $3,500.00 cash would help me right now: (Write your answer plainly here, in 20 words or less):

.....

.....

.....

Name .....

Address .....

Town..... *State*.....

Date I read your offer.....

"We'll Be Married Today!"

EXCERPTS FROM THE DIARY OF A MAN WHO MISSED A JOB AND *ALMOST* LOST A BRIDE

January 10th

I HAD a bad break today. I expected to get that assistant foreman job but George Smith got it instead. George is all right but he hasn't been in the shop as long as I have and I honestly believe the men like me better. Oh well, it's life, I guess—but Dot's going to be disappointed when she hears the news. A lot depended on that job and the money it pays!

January 13th

Told Dot tonight about losing out on that new job. It made me feel mighty bad when she cried. I didn't expect that—but she said it would be foolish for us to get married on what I am making. "What are you going to do about it?" she asked. "What did the boss say?" When I told her he didn't say anything to me, she flared up and said, *"Well, I'd ask him!"* That was an idea.

January 17th

I wonder what's wrong with me! For three days I tried to get up enough nerve to ask the boss why he didn't give me that job, and every time I start towards his office I get cold feet. But I've got to do it! Dot is going to ask.

January 20th

I told Dot tonight I hadn't had a chance to talk with the boss. "Chances are scarce with you these days," she said, and there was a look in her face that made me realize I'd better do *something.*

January 22nd

Today I screwed up my courage and walked right into the boss' office. The boss sat there and looked at me until I had finished talking. There was a deadly pause. Then he leaned over his desk and said in the calmest tone: "Jack, I like you and wanted to give you that job. I thought about it a long time. But my own job depends on the men I pick—and in self-defense I promoted the best *trained* man in this shop. You've been here longer, it's true, but while you've been wasting your spare time, George Smith has been studying an I. C. S. course. He has learned the things a man on that job *must* know, and you might profit by his example. If you do, I have something in mind for you."

January 23rd

I told Dot what the boss said. "Well," she said, "there's only one thing left for you to do—enroll for an I. C. S. course right away." I nodded approval of her conclusion. (I had already mailed a coupon to Scranton!)

November 1st

This is the happiest day of my life! A new job—a new wife—a new outlook on life! Dot said she would marry me the *very* day I got my promotion—and Dot is a girl of her word, bless her heart! I owe a lot to her—and to I. C. S. *training. There is no substitute for either of them!*

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☐ Architectural Draftsman
☐ Building Estimating
☐ Wood Millworking
☐ Contractor and Builder
☐ Structural Draftsman
☐ Structural Engineer
☐ Electric Wiring
☐ Electrical Engineer
☐ Electric Lighting
☐ Welding, Electric and Gas
☐ Reading Shop Blueprints

☐ Telegraph Engineer
☐ Telephone Work
☐ Mechanical Engineer
☐ Mechanical Draftsman
☐ Machinist
☐ Toolmaker
☐ Patternmaker
☐ Pipefitter ☐ Tinsmith
☐ Bridge Engineer
☐ Bridge and Building Foreman
☐ Gas Engines
☐ Diesel Engines

☐ Aviation Engines
☐ Automobile Mechanic
☐ Plumbing ☐ Steam Fitting
☐ Heating ☐ Ventilation
☐ Sheet Metal Worker
☐ Steam Engineer
☐ Steam Electric Engineer
☐ Civil Engineer
☐ Surveying and Mapping
☐ Refrigeration
☐ R. R. Locomotives
☐ R. R. Section Foreman

☐ R. R. Bridge and Building Foreman
☐ Air Brakes ☐ Train Operation
☐ Highway Engineering
☐ Chemistry ☐ Pharmacy
☐ Coal Mining Engineer
☐ Navigation ☐ Boilermaker
☐ Textile Overseer or Supt.
☐ Cotton Manufacturing
☐ Woolen Manufacturing
☐ Agriculture ☐ Fruit Growing
☐ Poultry Farming ☐ Radio
☐ Marine Engineer

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☐ Traffic Management
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Name.....*Age*.....*Address*.....

City.....*State*.....*Occupation*.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

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This magazine and its brother publication, Mechanical Package Magazine, are not connected with or associated with any other magazine of a scientific or mechanical nature.

MODERN MECHANIX AND INVENTIONS

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NUMBER 5

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PRICE 25 CENTS
30 Cents in Canada

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—here's a way to get it without having to pay it back!

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—not a loan—not an advance—nothing you have to return or pay back, but your own money—your cash to do with as you please.

Is it interesting? All right, here's the way:

Make an investment in the greatest, the surest profit-making possibility you ever heard of—your own self.

Train yourself definitely for the job ahead, or for a larger job somewhere else—build your ability to do more and make more for your employer.

Invest some of your spare time—at home—nights: the money cost compared to the possibilities of increasing your earning power is almost nothing.

Train under the LaSalle Problem Method—learn by doing—that's the interesting—the practical way.

Can *you* do it—are you fitted? Other men—average men—men from every walk of life and every vocation have increased their ability and their earnings through investing spare evening hours at home.

How would you like to have the experience these men have had? Here are a few striking cases out of thousands from our files who turned bleak futures into cash realities through LaSalle training.

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For instance, H. F. Lofquist, now a star Seattle salesman for Elliott-Fisher equipment, was working for an oil company—at a small salary and with little chance for promotion. Before completing half his LaSalle training in Higher Accountancy, his income doubled and now it is 250 per cent larger.

Incidentally, sales contest prizes won by Lofquist have paid for his training several times.

Doubled His Income

F. V. Tierman of Washington, D. C., was employed by the Government—with little prospect for advancement. Passing a window in which was exhibited LaSalle training material, he stopped, investigated and enrolled for Modern Salesmanship.

Like Lofquist, his income jumped before he finished the training—and today it is 103 per cent greater than when he enrolled. More important, he sees even better prospects ahead.

Now Has a Profession—and More Money

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The leaders of the next ten years will be determined in the next ten months.

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Name.....

Present Position .....*Address*.....

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Cards, Stationery, Advertising, labels, paper, circulars, tags, etc. Save money and time. Sold direct from factory only. Junior Press $8.90, Job Press $11, Power $149. Do popular raised printing like engraving with any of our presses. Print for Others, Big Profits. Pays for itself in a short time. Easy rules sent. Write for free catalog of outfits and all details. The Kelsey Co., K-9, Meriden, Conn.

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FAUCETS, HARDWARE without removing parts. Our outfit connects to your battery, no tank is used. $3.00 prepaid. Write for free particulars.

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$500 EXTRA IN 6 MONTHS

"In looking over my records I find I made $500 in my spare time in six months. My best week brought me $107. I have only one regret regarding your course—I should have taken it long ago."
HOYT MOORE,
R. R. 3, Box 919,
Indianapolis, Ind.

I challenge you to mail the coupon right away. That's how confident I am that I can train YOU at home in your spare time to become a Radio expert. I KNOW that when you see it, read it, examine it you will be delighted with its clear, simple way of teaching Radio. I KNOW—because I have ALREADY trained thousands of men. Many of them with no more than grammar school educations, and no technical experience, have become Radio experts and earn two or three times their former pay. Mail the coupon now before this offer expires.

Many RADIO Experts Make $50 to $100 a Week

In about ten years the Radio Industry has grown from $2,000,000 to hundreds of millions of dollars. Over 300,000 jobs have been created by this growth, and thousands more will be created by its continued development. Many men and young men with the right training—the kind of training I give you in the N.R.I. course—have stepped into Radio at two and three times their former salaries.

Get Ready Now for Jobs Like These

Broadcasting stations use engineers, operators, station managers, and pay up to $5,000 a year. Manufacturers continually employ testers, inspectors, foremen, engineers, service men, buyers, for jobs paying up to $6,000 a year. Radio Operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. Dealers and jobbers employ service men, salesmen, buyers, managers, and pay up to $100 a week. My book tells you about these and many other kinds of interesting Radio jobs.

Many Make $5, $10, $15 a Week Extra in Spare Time Almost at Once

The day you enroll with me I send you material which you should master quickly for doing 28 Radio jobs common in most every neighborhood, for spare-time money. Throughout your course I send you information on servicing popular makes of sets! I give you the plans and ideas that have made $200 to $1,000 a year for N.R.I. men in their spare time. My course is famous as the course that pays for itself.

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Special training in Talking Movies, Television, and Home Television experiments, Radio's use in Aviation, Servicing and Merchandising Sets, Broadcasting, Commercial and Ship Stations are included. I am so sure that N.R.I. can train you satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lesson and Instruction Service upon completion.

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J. E. SMITH, President
National Radio Institute, Dept. 2JH
Washington, D. C.

I want to take advantage of your offer. Send me, without obligation, your Sample Lesson and your book, "Rich Rewards in Radio."

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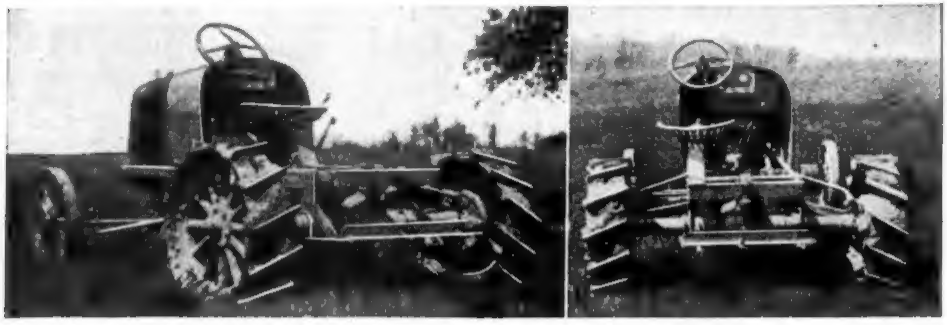

Here's a tractor made by Stanley Slazes, of Gray's Lake, Ill. Using mostly Ford Model T and Chev. parts, Mr. Slazes spent but $25 to get her into shape for serious pulling. Note the husky axle and the stout drawbar. We congratulate M-M reader Slazes for his job. She pulls a 14-in. plow and a ten-disc harrow without trouble. See column for details.

Andy's Shop Mail Box

Andy's Shop Mail Box column here is known to be death on all forms of hokum, bunk and bologna. You can paste his message in your hat for fall use. Sail in and get the low down!

SAY, gents, ain't she been a great summer? Cool and nice, and not much happening. The bees are buzzin' and everybody but Congress workin' hard.

Poor Senators! They're home recuperating from what's going to happen to them this fall. Got your broom ready? I'm doing some sweeping this fall myself—going to help Hoover clean out his Stymies and Lame-brains.

What a tough job that guy's had! A swell engineer with a great reputation, and us voters had to hand him what a great economist has said was the "lowest average body mentality that the U. S. had ever sent to Washington."

Put your chin in the palm of your hand and do some cogitatin'. And then next fall hit the polls hard: hit 'em hard, and hit 'em low.

* * *

This may not sound like a grease monk dishing the dirt, but Old Man Cooley, more affectionately known about the Hangar as Don, hollered across the field to where I was sittin' on the mower with my team of hosses, and says I gotta come in, By Gad, and git out my long leg of tripe for this month's issue or Malodorous Mechanix will have to suspend publication, on account of my readers (both of them) might quit me.

Harold Garvey and Glandel Dallas of Dyersburg, Tenn., built this beautiful little biplane from their own plans. We'll be interested to ask how she turns out.

So I gets me down off my clickety-clack Weed Annihilator, looks the sky over for incoming ships, and there being none for the time present, I leaves the hosses and the grass snips out on the tarmac for Sam Wing to hit when he comes down out of the clouds, and here I am.

* * *

I thought that up about votin' this fall—thought it up all by myself as I pulled at this weed and that, wading in to the hangar from midfield.

* * *

Cripes! The first letter I pick up concerns one of Sam Wing's scoops. His Mechanical Package Magazine (the third and latest issue) is a knockout, and in it he has a swell sailboat design by this Baltimore Bugeye Bug, Sam Rabl.

The letter:

Dear Andy:

For months I've been searching for plans for a little 18-20 ft. auxiliary cruiser that are 100% boat. In July M. M. I notice the ad for plans of your 18 ft. "Buddy" and from the picture she looks great. However, before parting with 4 hard-earned buck-dollars, I'd like a little more information. Haven't you a profile view of her, with accommodation plan, etc., so a person can see just what he's ordering? I am anxious to know the following—can you help me out?

Beam, draft, centerboard or keel; amount of outside ballast, if any; total sail area, headroom, speed with 5 h.p. (approx.), type of bottom, raised deck or trunk, cabin, etc., etc. Have you any figures on the lumber cost from

(Continued on page 12)

Men who work with their hands make the BEST
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We are looking for more ambitious young fellows with factory, building construction, or other mechanical experience to prepare for well-paid positions in Drafting. Such men, we find, are unusually successful as Draftsmen, because they know how things are done, and that's a priceless asset to the man who makes the blue-print plans. Get in touch with us and we'll tell you how you can cash in on your entire past experience.

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Please tell me, without cost or obligation, about your training in line marked X below.
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St. No. .....
City..... State.....
Age ..... Occupation .....

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WHERE THE METAL IS THIN

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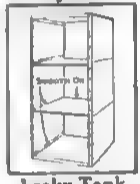
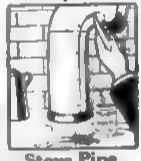
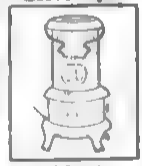


Leaky Tank


Stove Pipe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ANDY'S SHOP MAIL BOX

(Continued from page 10)

boats already built from the plans? Has anyone out this way built one yet?

Many thanks for any info. you can give. I'm sure in the market for a boat. Sincerely,

C. D. JACKSON,
Sausalito, Calif.

Well, now, Jackson old sock, I'll tell you.

Turn to page 36 of this magazine.

Take a good look at what ye see there. And you'll spy "Buddy" herself.

She is 18 ft. long. She is 7 ft. 6 inches beam. She's a keel boat, simple to build as an apple box. Nice V bottom, planked up a la Maryland and Chesapeake Eay style. Her total sail area is 150 ft. She has plenty of sitting room, and you don't have to have a bald head to do it, either. She's raised deck—a style that all specialists in small yacht design are rapidly swinging to. I don't know what she'd cost, as things like that are beyond me, and I can't get aholt of Sam Wing as he's now about 12 miles away up above Lake Minnetonka in his Cross Country Parasol.

But yez kin bet the boy has a real boat thar, and no foolin'!

* * *

Right out of the herring bucket where I properly pickle all good letters, comes this missive:

Dear Andy:

Put our names down on the list of those opposed to the law, (inflicted by aircraft manufacturers) forbidding the flying of amateur-built airplanes. We have been told that this law has been passed in Tennessee. If there is any movement being made to repeal this law, tell us, we will do more than our part to help repeal it.

We have already invested about $75 in the plane shown in the enclosed snapshots. Twen-

(Continued on page 16)

MIDLAND TIRE & RUBBER CO., Dept. 2323
1060-10 West Sixty-Third Street, Chicago, Illinois

The Season's Big Radio Sensation!

16-TUBE ALL-WAVE only $39.95

Completely Assembled with Large DUAL SPEAKERS

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WHAT a radio! One complete 16-tube chassis with one dual-ratio dial—new Super-Heterodyne circuit with a range of 15 TO 550 METERS ... No plug-in coils ... No trimmers ... Large acoustically matched Dual Speakers ... New CLASS "B" PUSH-PUSH Super Power Amplifier with six times the power of ordinary tubes ... Full band AUTOMATIC VOLUME CONTROL ... COLOR-LITE Multi-Wave Band Selector ... STAT-OMIT TUNING SILENCER ... Full FLOATING VARIABLE CONDENSER ... Complete Scientific Shielding ... Absolute tone fidelity ... Image Frequency Suppressor ... Fractional Microvolt Sensitivity ... 18-TUNED CIRCUITS ... ALL NEW TYPE TUBES, SUPER TRIODES, DUAL and TRIPLE GRIDS, Two Full Wave Rectifiers, including the new Mercury type. DUAL POWERED—two separate power transformers. A bigger, better, more powerful, more selective, finer toned radio than you've ever seen before ... offered at an amazingly low price direct from the big Midwest factory. Midwest engineers have far outdistanced all past performances in perfecting this new set.

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COMPLETE LINE OF [illegible]

The big new Midwest catalog shows gorgeous line of artistic consoles in the new six-leg designs. Mail the coupon now. Get all the facts. Learn how you can save 20% to 50% on a big powerful radio by ordering direct from the factory.

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Deal Direct with Factory SAVE UP TO 50%

Don't be satisfied with less than a Midwest 16-tube A C radio. A receiver covering only the regular broadcast waves is **only half a set.** Improvements in short-wave programs have made ordinary broadcast sets obsolete. The Midwest gives you regular, foreign, police and amateur broadcasts in one single dial set. No converter or any extra units required.

Investigate! Mail the coupon. Get the Midwest catalog. Learn the facts about Midwest 9, 12 and 16-tube ALL-WAVE sets. Learn about our sensationally low factory prices, easy payment plan and positive guarantee of satisfaction or money back.

TERMS as low as $5 DOWN

Read This! Just one of thousands of letters praising Midwest Radios.

GETS FRANCE, SPAIN, ITALY, JAPAN

"Have received foreign short-wave stations such as FYA, France; EAQ, Madrid Spain, 12 RO, Rome, Italy, and last but not least, JIAA, Tokyo, Japan. I really think the Midwest set is a miracle."

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Remember, you buy DIRECT FROM THE MAKERS. No middlemen's profits to pay. You get an absolute guarantee of satisfaction or money back. You try any Midwest 30 DAYS before you decide to keep it. Then, if you wish, you can pay in small monthly amounts that you'll scarcely miss. Mail coupon for full details or write us a postal.

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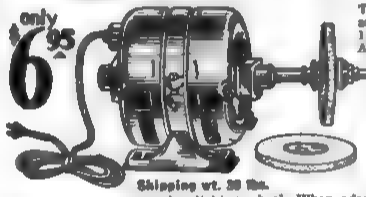

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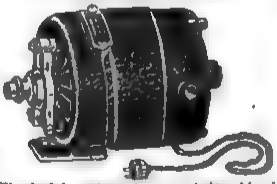

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ANDY'S SHOP MAIL BOX

(Continued from page 12)

ty-five dollars will complete it. This makes $100 for complete plane, ready to fly, including cost of every part of the plane such as motor and dope. We believe that this is about the cheapest a plane can be built. The motor is a 61 cu. in. Indian motorcycle motor.

We are sure that it will fly as it is all we can do to hold it back at half throttle. Here are a few of the specifications:

Wing Span (upper and lower)	18 feet
Length Over All	13 feet
Chord	34 in.
Wing Area	100 sq. ft.
Stagger	14 in.
Gap	32 in.
Approximate weight (as in picture)	230 lbs.
Motor horsepower	20

We will answer any letters written us.

Happy landings,
HAROLD GARVEY,
GLENDEL DALLAS.

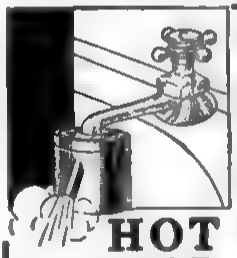
Which letter, being what it is, stands on its own merits.

Turn back to issue before last, boys, and see what Doctor Andrew has said about this licensing situation.

No need to feel downhearted about it. If you want to build and fly a ship, no one in heaven or hell can keep you from doing it providing you don't fly for hire, or fly from a licensed field. I gave all the state, interstate and Federal dope then. It is just as good today as when I shot it to you.

The artificial team of horses which was made out of old Ford and Chev. parts by Mr. Slazes, Gray's Lake, Ill., graces the head of my column

(Continued on page 21)



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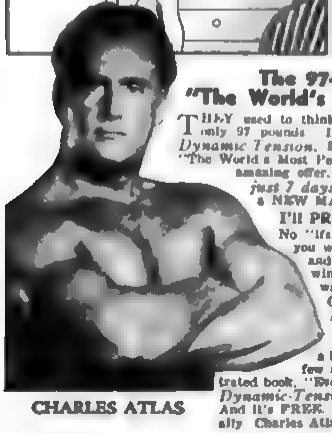

CHARLES ATLAS

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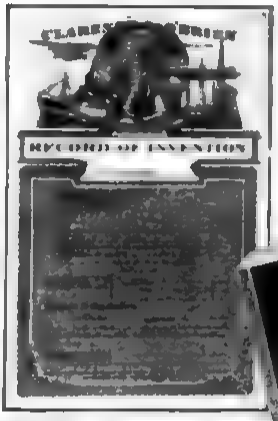

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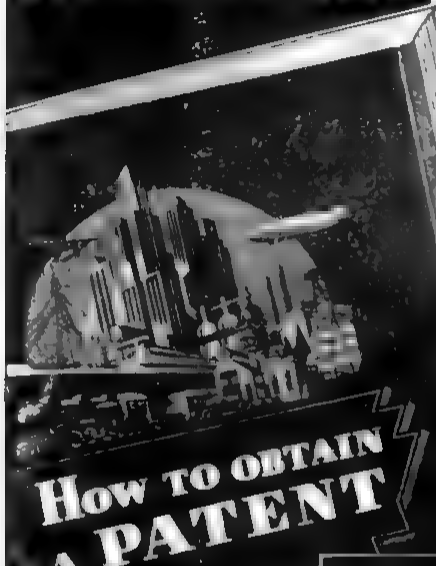
FOR... INVENTORS



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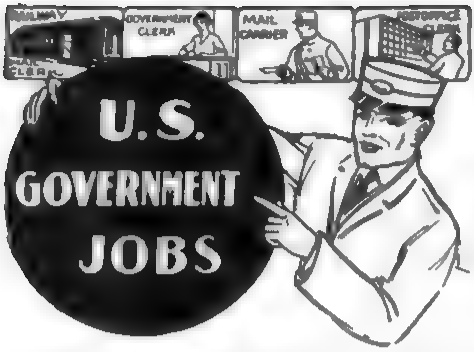

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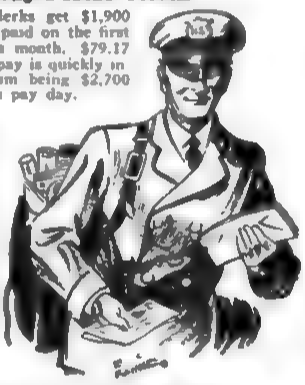

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ANDY'S SHOP MAIL BOX

(Continued from page 16)

this month. Here's what Mr. Slazes has to say about it.

Dear Sir:

I have received your letter and I am thanking you for your reply. I have been a reader of the Modern Mechanix for a long time, and would like to have you put a picture and description of my home-made tractor in your Andy's Shop Mail Box as soon as possible.

I am sending two pictures of it, so please put in whichever is the best. They are both rear views of the tractor, because I thought that the M.M. readers would like to see the way it is built. Plans are available from me if you care to build it.

STANLEY J. SLAZES,
Gray's Lake, Ill., Box 361.

There y'are, folks—anybody needing a good, cheap tractor to plow the garden knows where to get one.

* * *

What do you men think of this suggestion by Deacon Laumann?

Dear Sir (Andy):

This is the first time I have written to you but it will not be the last. I am interested in anything mechanical and especially airplanes, automobiles, boats, diving, hunting, athletics, and what have you?

I woke up this morning at six (yes, six A.M., E.S.T.), and I thought of the idea which prompted me to write this letter. Well, here it is: Why not start an Automobile and Motorcycle Manual, on the lines of the "Flying and

(Continued on page 22)

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ANDY'S SHOP MAIL BOX

(Continued from page 21)

Glider Manual," or perhaps it should be different? You probably know better than I what to put in it, but if you are in doubt, why not ask the gang? (I'll lend you my mail box if you say so.) I am inclosing an S.A.S.E. (Self-Addressed Stamped Envelope) for an answer to this idea (of mine?). Will you please let me know if it would or would not work?

I always read your Shop Mail Box first and second, when I get the new issue of MM. (Show this to the eds, eh?). That article on airplane licensing has cooled me down somewhat. Your brother, MPM, is a fine magazine, and I hope Sam knocks him into a monthly soon.

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Auf wiedersehen,
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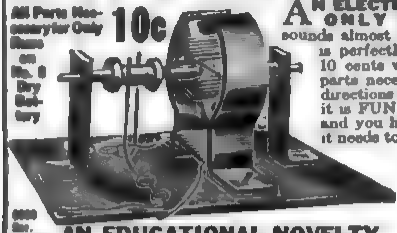

AN ELECTRIC MOTOR FOR ONLY 10 CENTS. It sounds almost unbelievable but it is perfectly true. For ONLY 10 cents we send you all the parts necessary, packed in a neat box, together with full printed and illustrated directions for assembling. No trouble at all putting the parts together, in fact it is FUN. Just follow a few simple instructions—it takes only a few moments—and you have your motor all ready to run. And OH BOY! Isn't it speedy! All it needs to run it is a No. 6 or similar dry battery. As to the fun you will get out of it, you won't have this motor an hour before you have it running and performing many novel and interesting experiments—has more power than you'd think. Besides, assembling the parts is an education in itself for any boy. Send 10c in any convenient form—stamps will do—and the motor will be sent you at once. Nothing more to pay—nothing more to buy.

AN EDUCATIONAL NOVELTY

JOHNSON SMITH & CO., Dept. 912, RACINE, WIS.

ONLY 10c Per Pair

Fighting Roosters

With very little practice you can make them implement parts of these Roosters imitate in the most lifelike manner the evolutions of a FIERCE COCK-FIGHT. Motion commenced. Will parade out of the pen. Send 10c. 2 pcs. 25c, postpaid.

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Very striking, quaint and mysterious. Silver finish and green-stone design; two brilliant, flashing gems sparkle out of the eyes. Send 10c. Bring good luck! Only 25c each.

Exploding Cigarettes

Ben contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is bent double and lighted, the whole gets a very great surprise as it goes off with a loud BANG! A great joke for other smokers. Entirely harmless. Price 25c box.

A Real Telephone. Works Indoors or Outdoors. 100 ft. or 1000 ft.

Though this is merely a very clever toy, it is quite as serviceable for short distances as the most elaborate apparatus made and it is not in the least liable to get out of order or to need adjustment, in fact it cannot be rendered ineffective unless roughly handled. No troublesome battery or intricate hook-up to bother with. Can be put to practical use from one room to another or down stairs, around corners, etc. The patented sounding discs transmit and receive the voice perfectly, making it a really practical talking telephone. Set consists of two phones, connecting cord and instructions. PRICE ONLY 65c per set postpaid. JOHNSON SMITH & CO.

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GREATEST CURIOSITY Smallest Bible in the World. Size of a postage stamp. Contains Lord's Prayer, Ten Commandments, etc. PRICE 10c each. 3 for 25c. 12 for $1.00. 100 for $7.50. Genuine Leather Binding with gold edges. Price 50c each, 3 for 1.25, 24-250 per doz. Engraving charge for name with Midget Bible 25c.

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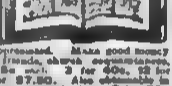
More fun than fighting with your wife. Look just like ordinary matches. As the victim tries to light one he gets quite a surprise. Price 10c per box, 3 boxes for 25c, 12 for 75 cents.

SERPENT'S EGGS



Box contains 12 eggs. When lit emit a dark, dark ash and suddenly burst to itself into a snake several feet long, which curls and twists about in a most lifelike manner. Price per box, 10c postpaid. 3 for 25c.

STAR TOY MAKER

Greatest boys' book written. Tells how to make Electric Camera, Canoe, model Railroad, a Telephone, Boomerang, Telescope, Drum, Electric Door Bell, Kite Talking Machine, Microscope, Electric Motor, Water Wheel, Paddle Raft, a pair of Skis, a Dog Sled, Bird House, Rabbit Yard, etc. 64 pages. 150 illustrations. PRICE 10c.

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TRICKS & SOCIAL ENTERTAINER. Contains hundreds of simple tricks, illusions, diversions that anyone can do. Also explains secret of second sight. Price 25c postpaid.

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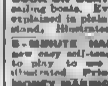
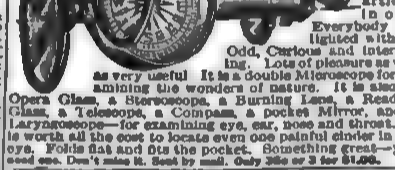


A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the head in a hand pencil, the interior cavities in a rose stem, and many other similar illusions. Price 10c, 3 for 25c.

LOOK 35¢ LOOK Wonderful instrument.



Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, Curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngoscope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail. Only 35c or 3 for $1.00.

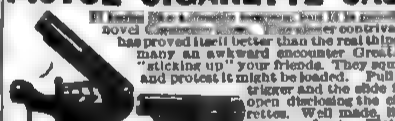
SERPENT'S EGGS

Box contains 12 eggs. When lit emit a dark, dark ash and suddenly burst to itself into a snake several feet long, which curls and twists about in a most lifelike manner. Price per box, 10c postpaid. 3 for 25c.

STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices, postpaid: 40 Bills 25c, 120 for 50c, or $1.50 thousand postpaid.

PISTOL CIGARETTE CASE



Novel Cigarette [illegible] has proved itself better than the real thing in many an awkward encounter. Great for "sticking up" your friends. They squirm and protest it might be loaded. Pull the trigger and the slide flies open disclosing the cigarettes. Well made, light and compact. Weight only 2 ounces.

PRICE POSTPAID 35c

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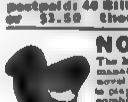

Fun Fun 10c

The Magic Nose Flute, or Harmonica, is so simple and novel in construction that to play with ease and mouth combined. There is just a little knack to it, which, when once acquired after a little practice, will enable you to produce very sweet music that somewhat resembles a flute. There is no fingering, and once you have mastered it you can play all kinds of music with facility and ease.

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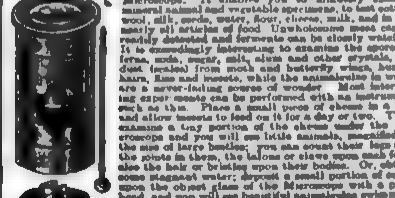
SURPRISINGLY GREAT MAGNIFYING POWER

EXAMINE GERMS IN WATER, CHEESE, SUGAR, ETC.



There are few things so interesting and valuable as Microscope. It enables you to minutely examine mineral animal and vegetable specimens, to find out what meat, milk, seeds, water, flour, cheese, and in fact nearly all articles of food. Unwholesome meat can be readily detected and fermente can be closely watched. It is exceedingly interesting to examine the nature of ferns, seeds, sugar, salt, alum and other crystals, the dust (scales) from moth and butterfly wings, human hairs, fleas and insects, while the animalcules in water are a never-failing source of wonder. Most interesting expe riments can be performed with an instrument such as this. Place a small piece of cheese in a box and allow it to remain for a few days or two. Then examine a tiny portion of the cheese under the Microscope and you will see little animals, magnified to the size of large bugs, moving about on their legs and the points in them, the tedons or claws upon each foot, also the hair or bristle upon their bodies. Or, obtain some stagnant water; deposit a small portion of scum upon the object glass of the Microscope with a pin's head, and you will see beautiful animalcules swimming about with as much freedom as though they were fish in the broadest ocean. It is a truly wonderful sight and an endless source of interest and enjoyment for everybody. The Microscope is made of brass and is capable of magnifying 600 times and although small and compact, is still power a very wide range of microscopic research. PRICE ONLY 65c postpaid. JOHNSON SMITH & CO. Dept. 912 RACINE, WIS.

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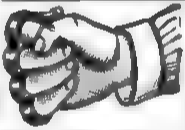
MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment..... $1.00

ANYONE CAN DO THEM

It is great fun mystifying your friends. Get the Conjurer's Cabinet and you will be the centre of attraction in your district. It contains the apparatus for ten first-class tricks, including THE MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket). The MINDOO TRICK CARDS (can be made to change commercially no less than five times). DISAPPEARING COIN BOX (a coin placed in the wooden box, vanishes entirely or changes into a coin of another denomination). The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured off the coin has vanished and is found somewhere else). the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth), the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WIZARD'S RING COIN TRICK, the ENCHANTED BOTTLE (no one but yourself is able to make it lay down), the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat), and last but not least, the GREAT PHANTOM CARD TRICK or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above a number of other tricks and illusions are fully explained for which you can easily make or procure the necessary apparatus. **Price 25c postpaid. JOHNSON SMITH & CO.**



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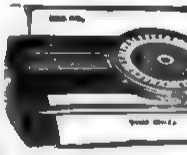
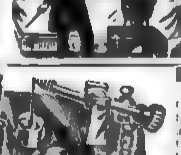


A perfect little typewriter for $1.50. There are thousands of persons who would like to use a typewriter but whose needs and business do not warrant the expense attached to the purchase and use of a fifty or seventy-five dollar machine. To such persons we confidently recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The letters of the alphabet most frequently used are so grouped as to enable one to write rapidly, the numerals 1 to 10, and the punctuation marks being together. With the machine you can send your best girl typewritten love letters, address envelopes, make out bills and do almost any kind of work not requiring a large, expensive machine. **Price complete $1.50** by mail postpaid to any address in the world. Stamps accepted.



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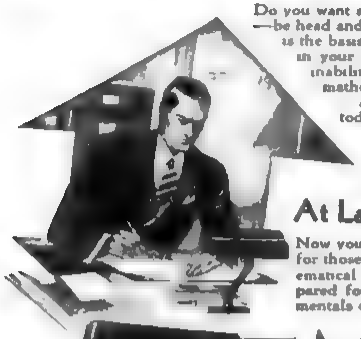

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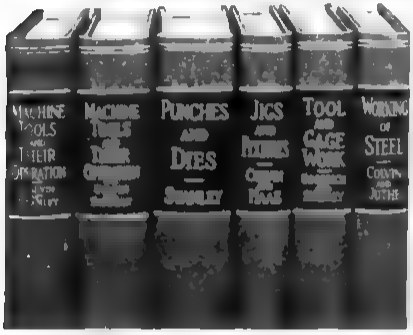

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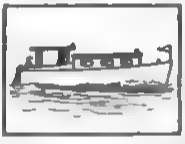

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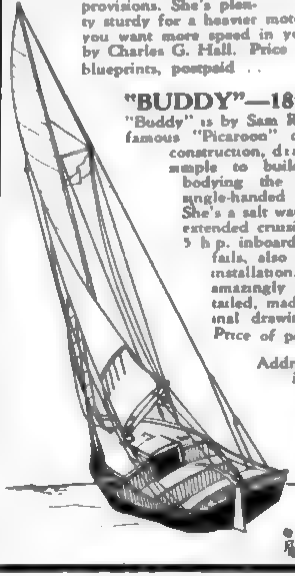

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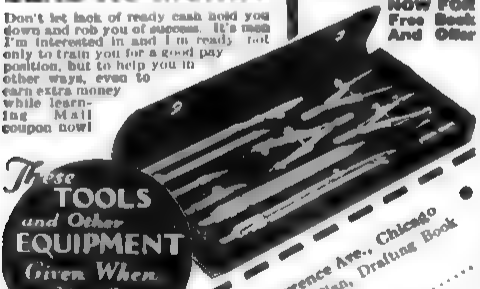

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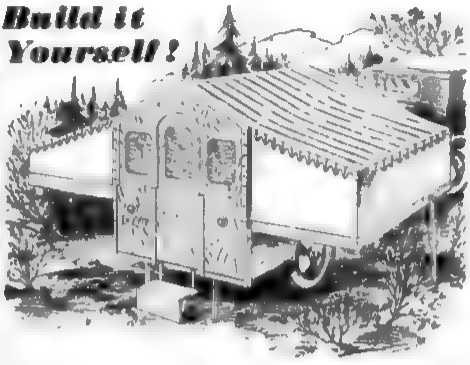

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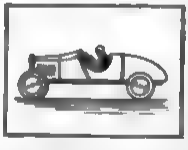

Racing body for a Model T Ford or similar chassis. The ample wooden frame is covered with chicken wire, a layer of cotton batting placed over it, and the whole held down with a covering of Fabrikoid, or imitation leather, which makes the job look like one of those custom built imported French models. Choose any color combination you like. This body has a streamlined tail like the big-time speedway racers. Hammer and saw and a few small tools are all that are needed to construct it. Looks like a million dollars, but can be built at an insignificant cost.

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Many other plans for boats (sail and power), airplanes, log cabins, home-built autos, etc., are available from the Blueprint Department of Modern Mechanix and Inventions. All prints are genuine blueprints for workshop use, made on tough paper in large size—ideal to work from. Address orders and inquiries to

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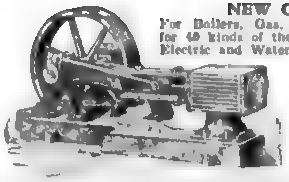

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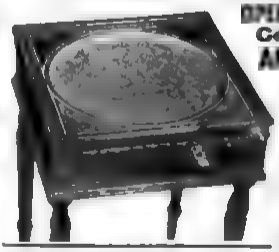

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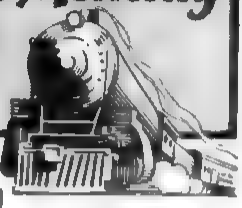

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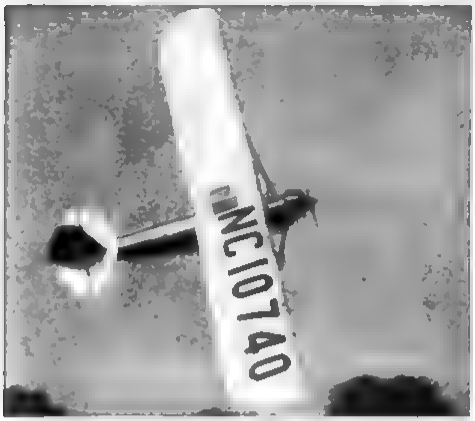

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Plans for a Penguin Practice Plane — motorcycle-engine ship for boys; does not take off the ground
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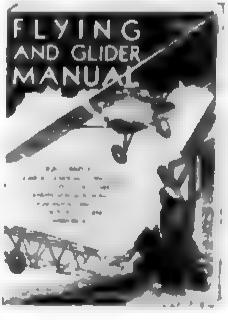

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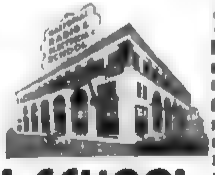

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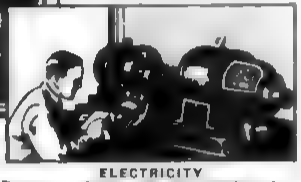

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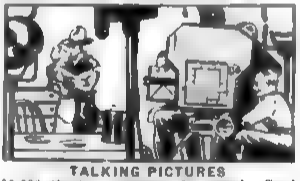

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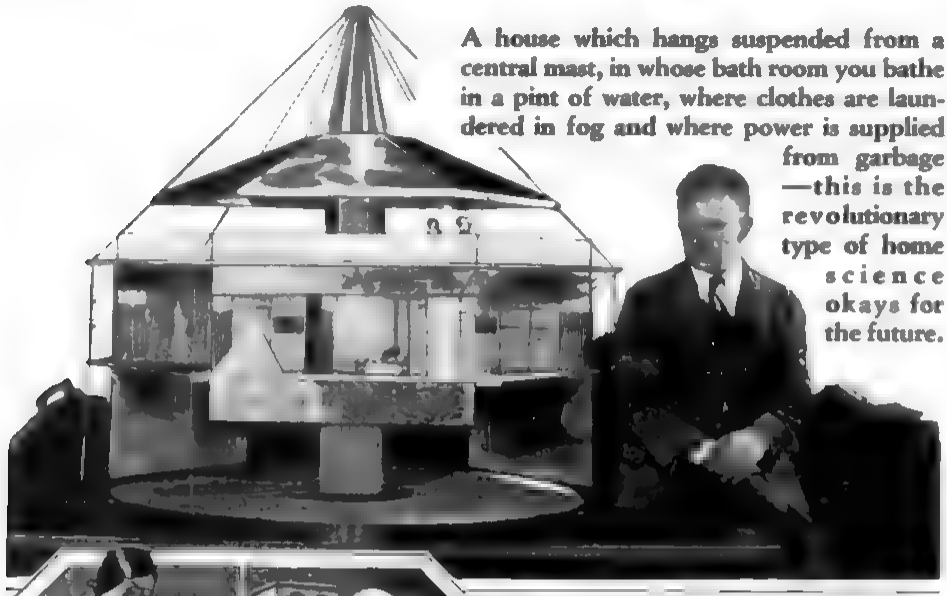
HOUSES that HANG from

A house which hangs suspended from a central mast, in whose bath room you bathe in a pint of water, where clothes are laundered in fog and where power is supplied from garbage—this is the revolutionary type of home science okays for the future.



Buckminster Fuller, designer, with a model of his "Dymaxion" or toad stool house. Note the central mast from which the floors are hung. At left—dishes are washed mechanically by a fog bath inside a special container; baths are taken with a fog gun and a pint of water.

A "TOAD STOOL" home, delivered to your own plot of ground and assembled at a complete cost of $2000 for an average-sized house—including furnishings of as radical design as the house itself—is the latest contribution of architecture to the solution of the ever present housing problem.

The house has rooms, walls, floors, but except for these essentials it bears but an obscure resemblance to what we are accustomed to think of as a home. It literally hangs from a pole, a hollow central mast in which all the power units of the house are installed, and it is crammed with amazing labor-saving devices driven by power derived from refuse.

Buckminster Fuller is the New York architect who has thrown tradition overboard in creating what he calls his "Dymaxion" house. He first announced his idea some time ago, but only recently has he completed the finishing touches which put his creation on a commercial basis.

"I started in to develop a dwelling," says Mr. Fuller, "that would be more comfortable, more habitable, more sanitary, more economical, more self-contained and which could be operated at the least expense of human energy. When I started it was with an inquiring mind. I decided to accept no housing feature because it 'had always been used,' but to pick only those features which proved necessary and expedient. That left me with floors, ceiling and walls. I think I can safely say that in those features is found the only comparison between my Dymaxion house and the common dwelling of today."

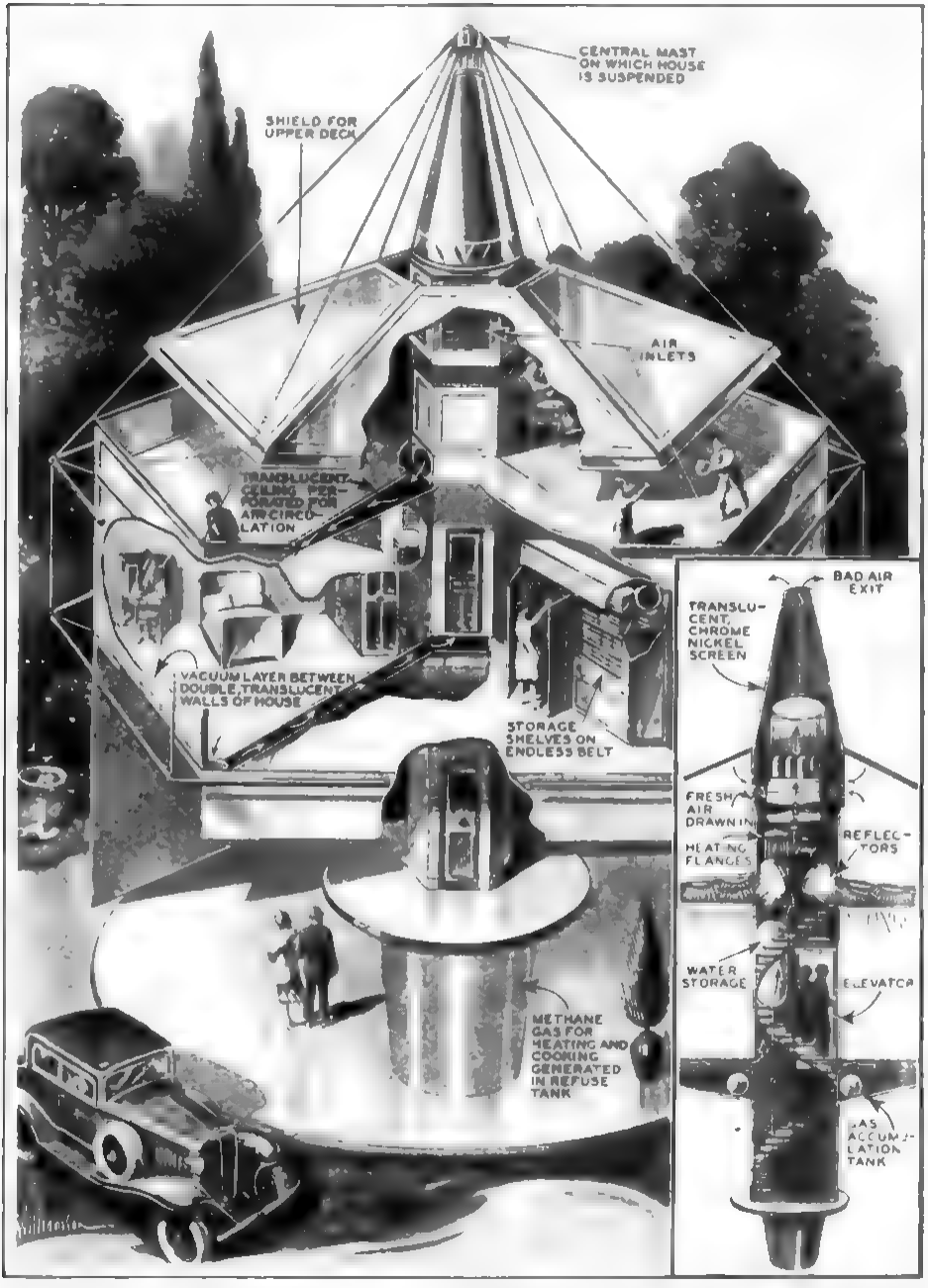
Living Quarters 14 Feet Above Ground

Such a statement is no exaggeration. The only stable member of the "Toad Stool" house is the central mast. The entire weight of the structure is hung from this mast. Also, contained in it is the machinery for the completion of hundreds of humdrum tasks, even to the elevator that eliminates the necessity of stairways in the house. It carries tenants from the ground to the living quarters 14 feet above, or an additional 12 feet to the suspended play deck.

a POLE!

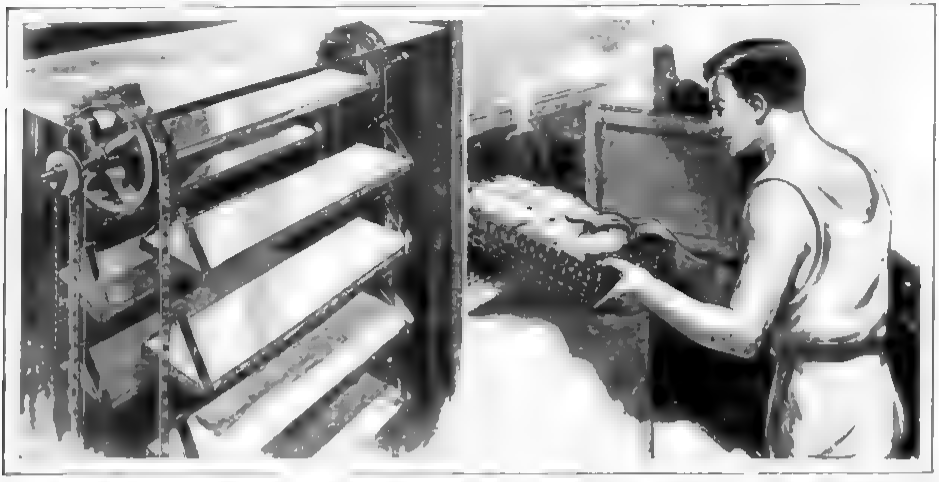
"Toad Stool" Houses for $2000

by KNIGHT DEACON



Essential details of "toad stool" house are shown here. Note that central mast from which it is hung contains all operating mechanism—air conditioners, heating units, reflectors for lighting rooms, and generator for creating gas from refuse.

Shirt Dirty? Launder in Fog Bath; Ready to Wear in Three Minutes



Every inch of space in wall closets is made useful by means of the endless chain system of shelving, pictured at left above, similar to dumb waiter principle. To launder a shirt, it is placed in a wire basket, inserted in fog bath, and three minutes later is delivered perfectly clean and dried by centrifugal force. Everything automatic except the pressing.

The entire house, including the roof, is enclosed in double-pane translucent or opaque vacuum plates. Thus, the vacuum insulates against heat or cold and helps maintain the constant temperature of the house winter and summer. This feature represents only one of the sixty-two basic patents of the dwelling as held by Mr. Fuller in conjunction with the Structural Study Associates.

Light Weight Metals Used

Fuller says of his creation: "These new houses are structured after the natural systems of humans and trees, with a central stem or backbone, from which are dependent all pumping, supply, filtering units, arterial systems, nerves or reception units, with appropriate coverings for temperature retention. This results in a construction similar to an airplane, light, taut, and profoundly strong. The central tower is composed of high pressure, inflated duralumin tubes in flexible-jointed triangulation with piano steel guys, similar, except in its superior strength and weight efficiency, to the battleship mast, radio mast, lighthouse or dirigible mooring mast."

Guy Wires Insure Stability

"The load requirement of the house is so light that, balancing compression and tension perfectly in this central mast method, the complete mast for the two-deck house, together with the tubular floor beams, has a total weight of less than 1000 pounds. Stability is further insured by the guy wires that run from the top of the mast to the corners of the building proper, then to their anchorage in the ground.

"There are a number of advantages to its height from the ground. It is safe from flood dangers, exposed to a maximum of sunlight and air, and its occupants are safe from unwelcome attentions of marauders."

To get a complete picture of this most revolutionary of housing constructions it is necessary to start at the bottom of the tower. Mr. Fuller will be our guide on a fanciful tour of the completed dwelling.

Walking up to the shiny duralumin tower on a well-kept pebble walk we stop at a seemingly impenetrable mast. Smiling, Mr. Fuller holds his hand before a small aperture. "It is a photo-electric eye," he says, "and it controls the elevator." There is an instant's delay, then a sliding door rolls back and the triangular elevator is ready. We step in and the door closes behind us as the car moves upward.

Air Conditioned Perfectly

It takes but a few seconds to arrive at the dwelling level and our guide points out that any side of the triangular elevator will serve as a door. We step out onto a composition floor something like bakelite in appearance, yet spongy to the tread. "The floor is inflated as well as protected against temperature changes by a vacuum chamber underneath," says Mr. Fuller. "If you wish you may discard your shoes or all of your clothing. The temperature and moisture content are both constant. It is not even necessary to wear bedclothes at night."

Struck by the beauty and width of the view through the immense double glass that represents the side of the house, it is impossible to resist the impulse to go closer. Spread out before us is the perfect panorama of the countryside.

"If you desire," interrupts our host, "you may swing the side of the room outward." Again his hand flashed before a photo-electric eye and the glass side of the room swung outward while a protective sill slid up to keep the unwary from falling to the

ground. "Nature's habit of stirring dust and carrying it in the air rather discourages the opening of one side of the house to the elements, but there is no good reason for so doing unless the day is an unusually fine one. It is always comfortable inside. Look up here!"

Wondering, we follow the pointed finger of our guide, directed at what appears to be ventilation slots in the mast itself. "Those cracks are used for heating, cooling and supplying uniformly fresh and moist air," he says. "No dust is brought in through them. The air is carefully cleaned by centrifugal pumps before being brought in. It will probably interest you to learn that the fans which bring the air in are driven by gas turbines. The gas is *methane*, generated from human refuse, vegetable peelings, remains of food, etc. It is one of the hottest burning vapors known to science and is afterward used for heating and cooking.

"You understand," continued our host, "that the Dymaxion house may be divided into as many rooms as desired. However, it is not necessary to go to the bedroom to change costumes."

At this point Mr. Fuller stepped over to the dividing partition and held his hand before another photo-electric eye. Through a transparent panel we were surprised to see shelves and closet space moving past us. Evidently, they were suspended on an endless belt running completely around the partition. Our host explained that this was correct and demonstrated the variety of articles that could be thus stored by stopping one compartment and removing shoes. Still another yielded men's suits, and a third contained shirts and underclothing. Yet another held books.

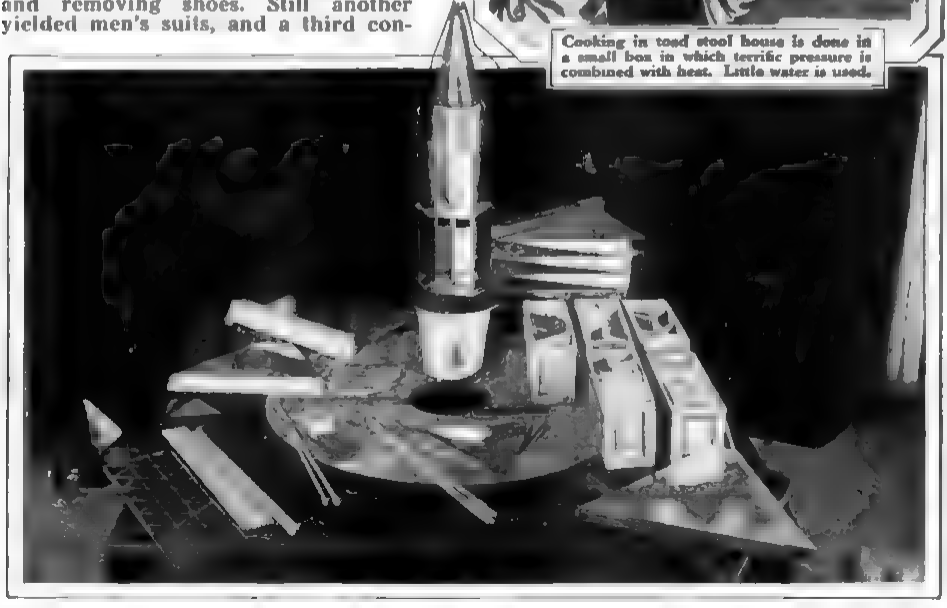
"This is the bedroom," explained Mr. Fuller, walking into a sizeable room containing a large bed which proved to be pneumatic. The walls contained the same arrangement of rotating closets we had noticed in the other room.

Colored Lights for Rooms

Looking upward, one is aware of the uniform glow of light from the ceiling, accompanied by a slight coloring. A question brings the information that the house is entirely lighted by diffusion. By means of prisms, mirrors, and lenses, a central lighting system in the mast diffuses illumination to all parts of the house. The result is the elimination of all lighting fixtures and the expense of wiring. The regulation of a wall switch turned the lights from pale pink to

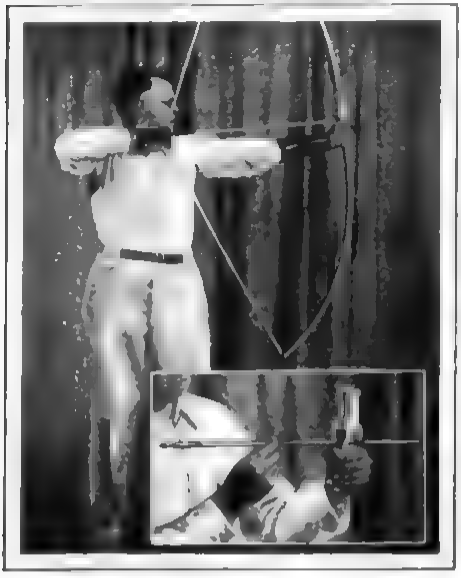
(Continued on page 156)

Cooking in toad stool house is done in a small box in which terrific pressure is combined with heat. Little water is used.



Various parts of the toad stool house laid out on this table show how easily they can be standardized for quantity production. Cost of building is practically halved by this method, a five-room house selling for approximately $2000.

Long Bow With Hole in Middle Improves Archery Scores



Archery marksmanship is greatly increased with new long bow with aluminum center piece as shown above, through which the arrow is drawn to full length and discharged.

ARCHERS will be able to make better scores with a new type of long bow now available. What features this new bow and makes for greater accuracy is an aluminum center piece which strengthens the wood and at the same time provides an opening through which the arrow is drawn back to its full length and then discharged.

According to the inventor, who spent $4,000 and 18 months in perfecting the new bow, the innovation provides accuracy three times as great as with the ordinary bow. With improved marksmanship, archery is expected to have greater appeal.

Eat Roughage for Good Health

THE average healthy man who wants to keep his digestive system in good working order needs to eat in his food enough roughage to provide about one quarter of an ounce of pure fibre a day. To obtain this amount you should consume about one and one-quarter ounces of bran or about three ounces of fresh grapes, or four apples.

Holder Keeps Brushes in Trim

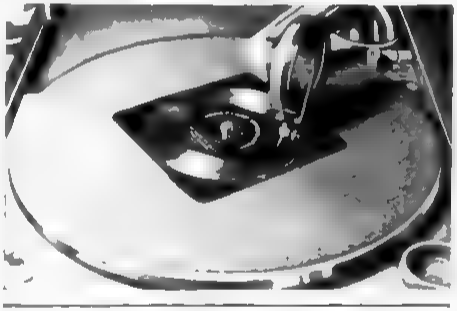
A MUCH desired addition to painters' equipment is a holder which will go a long ways towards keeping brushes soft and pliant. As shown in the photo, the holder consists of a metal band, adjustable to any size can, and equipped with prongs that grip the handles of the brushes. With this arrangement the brushes are kept suspended in the turpentine, so that they are prevented from losing their fibre. A set of arms which lap over the edge of the pail keep the holder in place.

Holder keeps paint brushes soft and pliant in turpentine.

Talking Ad on Phonograph Record

THE most up-to-date stunt of advertising is "talking" to your prospect in his own home by means of a tiny phonograph record sent through the mail. The record, made of an unbreakable substance, does not even require an envelope, the address simply being pasted on the back. It is square, about four by four inches, to facilitate handling in the mails.

Recorded on it is a miniature radio broadcast. It opens with music which fades away to provide a background for the advertising message and again ends with music. The message lasts well over a minute.



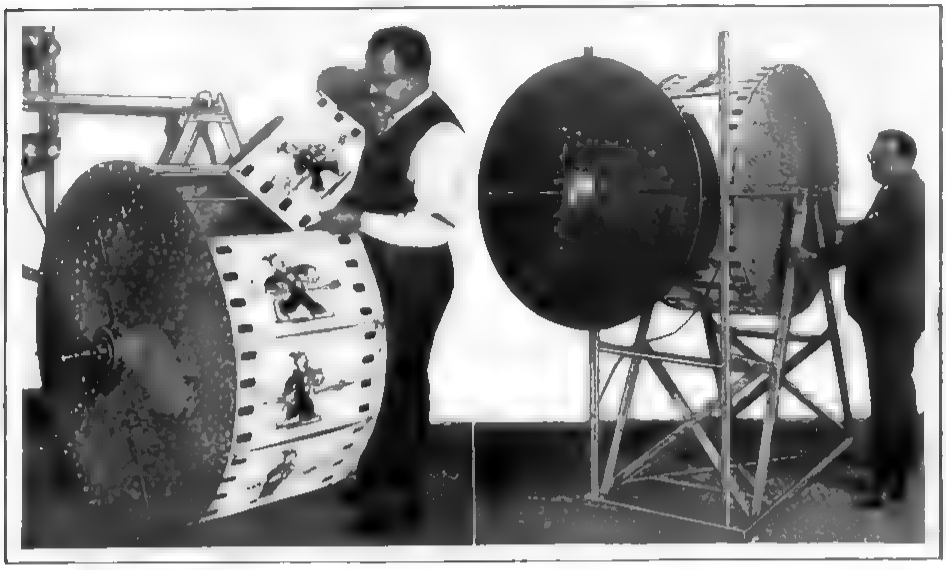
Here's latest in advertising—a record which talks to prospect in his own home, message lasting over minute. Record is four by four inches square, made of unbreakable Durim.

You're Only as Old as You Feel

THE idea that elderly people are only as old as they feel and might be as alert and active as youngsters if they but made themselves believe so, has now received unexpected support from scientists.

It is believed that the relatively small deterioration which does occur in old age is intentional on the part of the bodily machinery. The deterioration is a kind of governor devised to protect that machinery, and the slowing down of the physical functions is perhaps the chief cause of the proverbial caution and good judgment of elderly people. In any event, the deterioration of old people appears more in feeling than in fact.

Machine Shows Cartoons Without Screen

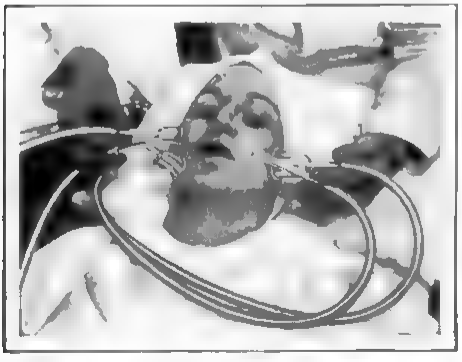


Left—Max Fleischer, movie cartoonist, placing individual drawings on drum of his new machine. At right is seen machine in operation. Drum and shutter revolve in synchronism, so that by standing in front of machine flickerless picture is seen.

Suction Treatment for Beauty

A BEAUTIFYING method that cleans the skin by suction, utilizing vacuum cleaner principles, has made its appearance. The system makes use of a small electric motor driving a vacuum pump to which are attached four flexible hose.

On the end of each hose is a nozzle made of glass which is run over the face in the same manner as a vacuum cleaner, the suction drawing all the dirt out of the pores of the skin. While the suction is very gentle, it is sufficient to remove all blackheads and smooth out wrinkles.



Blackheads are drawn out of skin and wrinkles smoothed down by suction through glass nozzles which fit on end of rubber hose running to motor-driven vacuum pump.

A NEW idea in motion pictures machines has just been developed by Max Fleischer, the well-known movie cartoonist. The mechanism, shown above, consists of a large cylinder on which are attached cartoons of the various comic characters, and a large rotating shutter with two narrow slits on either side of it.

As the cylinder is rotated, the shutter revolves in unison, so that by standing at a point in front of the machine and looking at the right portion of the shutter, animated cartoons of amazingly smooth action can be viewed.

In contradistinction to the common movie projector, Mr. Fleischer's machine has no intermittent action, and the big wheel never stops but revolves continuously. A full picture with smooth flickerless action is the result.

Densities in World Vary Widely

THE wide variations in the density of matter in various parts of the universe have been tabulated by the Research Laboratories of the Eastman Kodak Company. Out in interstellar space the atoms are found to be more than a billion billion times scarcer than in ordinary air, while in the star interiors the atoms are so compact that they form substances thousands of times heavier than lead. On the moon, the atmosphere is so thin that it has less gas than the best vacuum ever produced in our laboratories. Low gravitational pull accounts for this condition.

Fold-up Auto Table Handy for Business Men and Tourists

Auto table, ideal for business men or tourists, is suspended from roof by folding arms as shown. It can be adjusted to any position and serves as luggage carrier when folded up.

BUSINESS men who want to clean up office work while riding to or from their places of business, and picnickers or auto tourists who can make good use of a dining bench, will find extremely helpful an adjustable table which has just been introduced in England.

The table is suspended from the roof of the car by a pair of folding arms, as illustrated in the accompanying photo, and can be moved backwards or forwards and adjusted for various heights. When not in use it may be pushed up to the roof of the car, where it may be utilized for storage purposes.

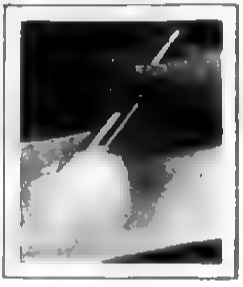
Equipping your car with this table is simply a matter of securing a pair of strips to the roof. Vibration is reduced to a minimum by the extreme flexibility of the arms.

Play Midget Golf on Your Lawn

INCURABLE golf addicts will welcome a miniature golf course which can be installed on the lawn for practice between regular games. The equipment, consisting of the parts shown in the photo below, comes in a compact case, and includes all hazards, number pennants, and holes. Either a six or nine-hole game is procurable, and may occupy any space you have available. Having the last word in portability, the equipment may be moved about —but not during the game.

Metal Pencil Has Electric Light

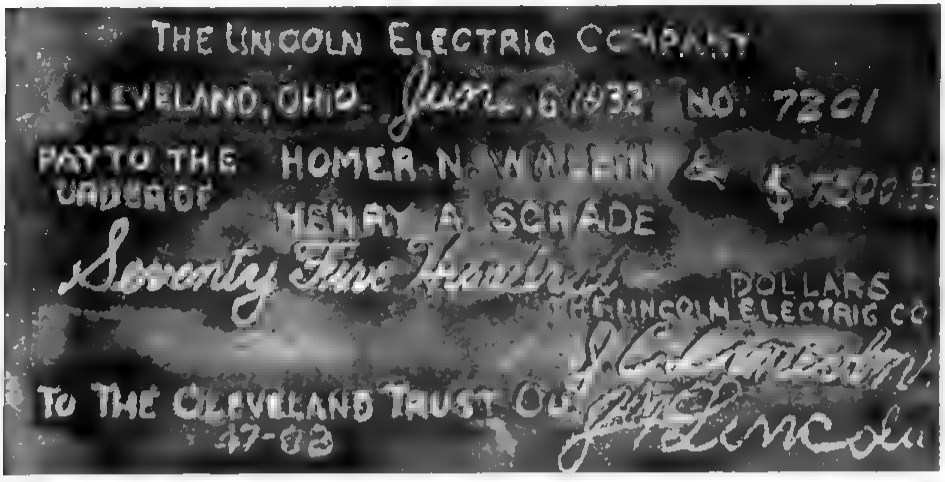
WRITING in the dark presents no difficulty at all with an electrically-lighted pencil that has recently been placed on the market. A small flashlight bulb just underneath the lead furnishes the illumination, the battery being held in the extra large handle. As to the lead, that is secured in place by a small tube in the end, as illustrated in the accompanying photo. Pressure on the switch on the side of the barrel is all that is necessary to put the light into operation.



Pencil has a flashlight bulb under lead for night writing.

Complete miniature golf course, with six or nine holes, is installed on lawn as illustrated here for entertainment of dubs or professionals. Hazards, pennants, and holes come in compact cases and may be set out on lawn in few minutes.

Arc Welders Write Non-bouncing Check



Something new in checks. It's made of sheet steel, 24 by 10 in., and the printing was inscribed by an arc welding torch. The check was an award made to winners of the Arc Welding Contest conducted by the Lincoln Electric Co., Cleveland, O.

Mechanical Manequin Draws Crowd

MACY'S, the world's largest department store, situated in New York, has on display in its windows a mechanical gadget which has been drawing huge crowds of window shoppers.

The device closely resembles a merry-go-round of small diameter, but instead of horses and other animals the attractions are women's dresses. Hangers which hold the dresses are suspended from an overhead disc which is turned by a motor. As the dresses pass before the spectators, the mechanism causes them to make a complete turn, thus displaying the garments from every angle.

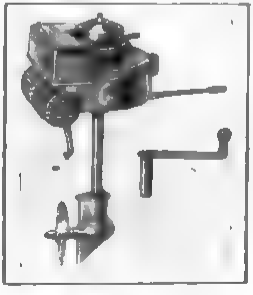
Mechanism of this manequin displays series of dresses to window shoppers before New York department store.

NO ONE can say the check shown above has any bouncing capacity. It's made of sheet steel, 24 by 10 inches, and has the letters engraved in a way that they can't be erased.

Seriously, however, the check is an award made recently to winners of the arc welding contest conducted by the Lincoln Electric Co., of Cleveland, Ohio. All the writing and printing on the check was inscribed with an arc welding torch by the winners, Homer N. Wallin and Henry A. Schade. The check was cashable at the bank just like its paper brothers.

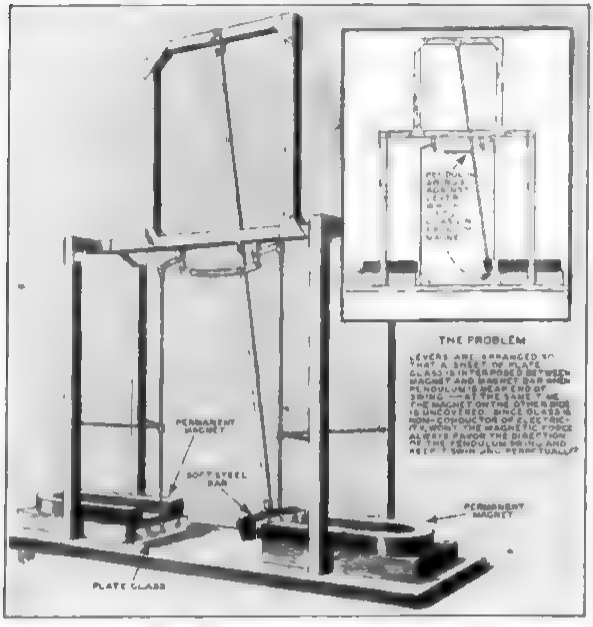
Toy Outboard for Model Boats

SOMETHING new on motor equipment for scale model boats is the perfect replica Orkincraft outboard shown in the accompanying photo. It is especially designed to fill the need for a serviceable power plant in outfitting the handiwork of model builders. With the powerful spring in the top-housing operating at highest efficiency, the motor will propel a 22-ft. sea sled an average period of four minutes within a cruising radius of 500 feet. The housing is finished in an attractive coloring, and the entire motor is mounted by a swivel bracket to the miniature craft.



This miniature outboard for model boats is powered by a watch spring in top-housing. Drives a boat about 500 feet.

More Cash for SOLVERS



Were you among the hundreds of readers who discovered that the Magnetic Pendulum would not work? The winning letter in that brain tickler problem is printed below, and there is also presented a new problem for whose solution some keen-witted reader will walk off with a $10 check.

REMEMBER the Magnetic Pendulum problem presented in our June issue? For the benefit of readers who may have missed it, the illustration above is reproduced.

This is the way the problem was stated: A pendulum with a soft steel bar at its end swings freely between two horseshoe magnets, which exert an attraction on the steel. But with each swing of the pendulum, a glass plate is swung up in front of the magnet. Glass is a non-conductor of electricity —therefore, won't the magnetic force of the magnets be shut off alternately so that the pendulum is kept swinging perpetually?

Practically all who answered the question spotted the fundamental fallacy that glass, though a non-conductor of electricity, has no effect on insulating magnetic force. There is no known insulator against magnetism. The letter which won the $10 offered for the best explanation, in the opinion of the judges, follows:

To the question: "Will this pendulum work?" The answer is: "NO."

However, the problem is an amusing one and may be readily explained. There are three major reasons why this pendulum would not work, either at the start or continuously.

First: Although it is true glass is a non-conductor of electricity, it is not an insulator to the lines of force exerted by a magnet, which in turn cause the attraction of steel bodies toward it. Therefore, it would be found that the pendulum, upon being started, would be attracted to one side and held by the magnet regardless of the position of the plate glass.

Secondly: Since the mechanical arrangement necessary to lift or lower the sheets of glass would offer such a resistance or drag to the pendulum, thereby retarding its freedom of motion, it becomes apparent that the force of attraction necessary to keep the pendulum going would require one greater than the magnet shown could produce, since the force of attraction exerted by a magnetic pole varies inversely as the square of the distance between the pole and the body being attracted.

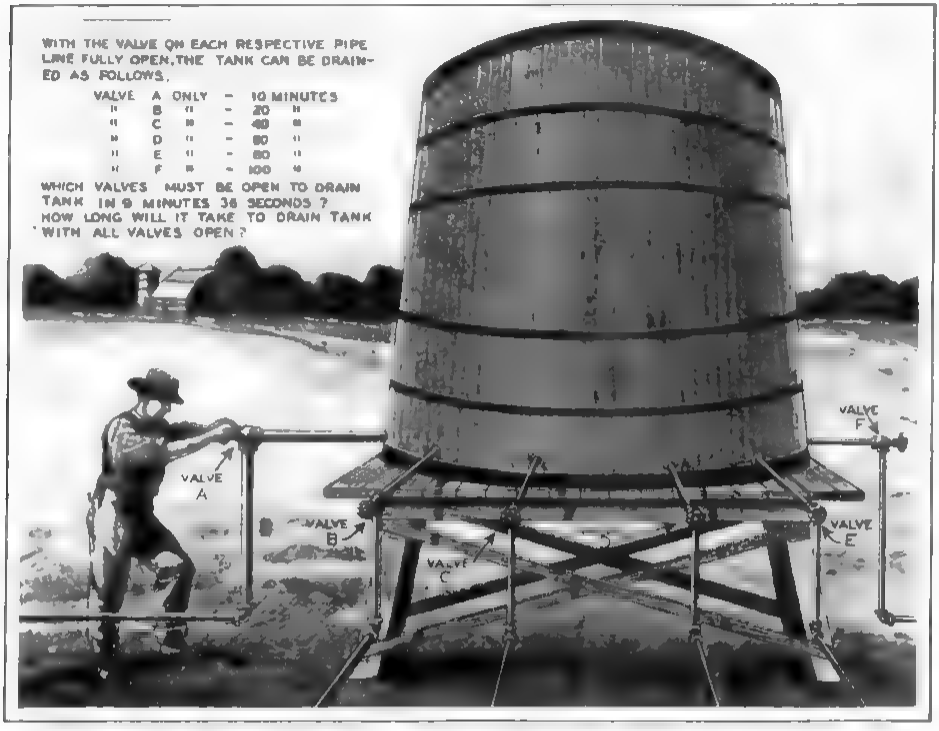
Third: Permanent magnets, contrary to their name, lose magnetism with use and age and become very weak, thereby necessitating their remagnetizing or replacing with new magnets from time to time. In order to magnetize a bar of steel some sort of energy must be used in the process, and therefore it can be clearly understood that such a machine could not be called a "perpetual motion machine."

C. R. SHENBERGER,
Box 126, Union, Illinois.

The attraction of objects by a magnet through glass is simply proved. Hold a horseshoe magnet beneath a piece of glass. Place a needle or other small object directly over the magnet on top of the glass. By moving the magnet slightly, the needle will move also, changing its position in respect to the lines of force exerted by the magnet through the glass.

So many excellent analyses of the problem were submitted that it was a difficult task for the judges to single out the prize-winning letter. Contributions of particular excellence were received from Nathaniel B. Wales, Jr., Tyndale Van Kirk, Irving E. Sommermeyer, R. Gay, Avery Sewell, Gilson Willets, Gordon Short (who submitted a perpetual motion problem of his own, operated by water buoyancy), S. Alex Haverstick, Lloyd De Groodt, Louis M. Nicholson, Karl F. Haworth, Roland H.

# of PUZZLE PROBLEMS



Gardner, Otto Foit, Oliver B. Allen, Jr., J. B. White, Leonard E. Toomey, P. E. Tibbets, Frederick I. Miner, Adrian Lowenthal and W. A. Brett.

The Author's Answer

This problem was originated by Dick Cole, whose answer follows:

> **The statement that glass is a non-conductor of electricity is correct, but neither glass nor any other known substance is an insulator of magnetic lines of force. Therefore the pendulum would merely swing to one magnet and stay there.**

Perhaps Dick thought that his tricky phrasing of the question ("glass is a non-conductor of electricity") would fool MODERN MECHANIX puzzle-solvers, but if so, the laugh is on him. Almost without exception, readers saw through his little deception and advanced other reasons which Dick apparently didn't think of. It was quite obvious that as a practical invention, Dick's perpetual motion machine was a complete frost.

Unfortunately, everybody couldn't win, but for those who lost out this time we present a new problem, described at the right. If you're good at arithmetic and logical in mind, you stand a good chance of cashing in on your talents to the tune of $10.

The New Problem:

The illustration above shows a water tank of indefinite capacity. From it lead six valves, each of which can be opened to permit water to drain from the tank at varying rates of speed. Valve A drains the tank in 10 minutes, B in 20, C in 40, D in 60, E in 80, and F in 100 minutes. Which valves must be open to drain the tank in 9 minutes and 36 seconds? How long will it take to drain the tank with all the valves open?

For the best letter explaining the processes of arriving at the correct answer, MODERN MECHANIX AND INVENTIONS will pay $10, and others used will be purchased at space rates. Address your answers to Contest Editor, MODERN MECHANIX AND INVENTIONS, 529 S. Seventh St., Minneapolis, Minn. Letters should not be over 300 words in length, and must be postmarked on or before Sept. 15, 1932. Contributions will not be returned unless accompanied by stamped envelope.

Perhaps you think that the problem as stated gives you insufficient data to go ahead on, but a brief consideration will show you that it is a problem in relativity —not the abstruse Einstein brand, but a simply logical one which requires nothing more than a clear head and a pencil to solve.

"Mechanical Maid" Slides on Track to Dining Room Table

Here is conveyor of the "mechanical maid," which travels between the kitchen and dining table. Electrically heated, the cans keep the food warm while waiting for "seconds."

WHAT might be called a "mechanical maid" recently made its debut before the National Inventor's Congress held in San Francisco. In reality, the device is a conveyor which slides on a track from the kitchen range to the dining table.

Electrically heated, the container of the system, shown in the photo at the right, keeps the food warm and steaming, so that there need be no more cold meals. Food to be served is placed in the pots and pans at the range, the conveyor is then set in motion, and all the hostess has to do is dish up the edibles by her side at the table.

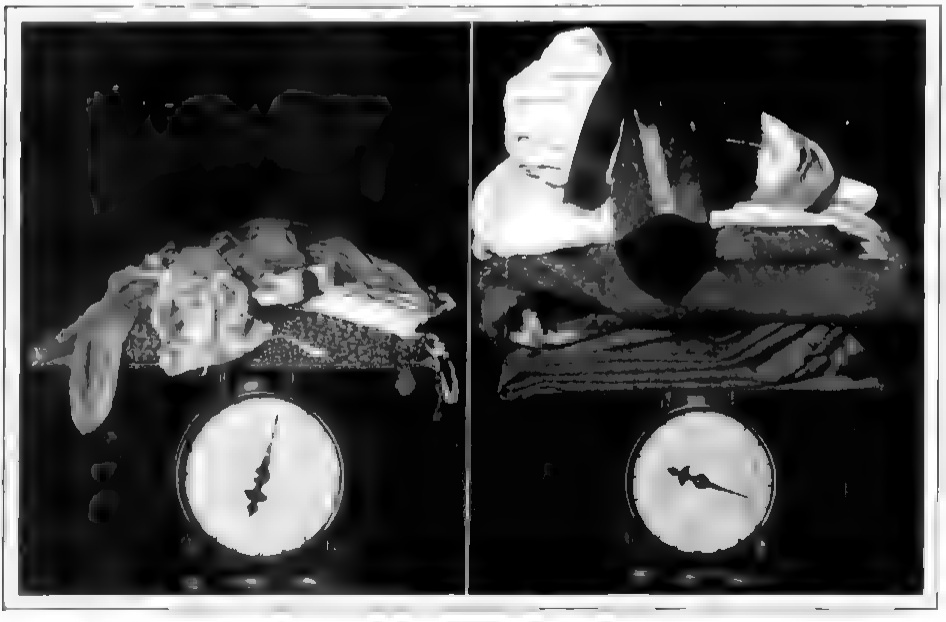
When the meal has been served, the conveyor may be pushed to one side to wait till second helpings are to be called for. In case another course is desired the mechanical maid can be sent back to the kitchen, where it is loaded up as per orders.

Fashion Slavery Hampers Men's Working Efficiency in Summer Time

MOST of us civilized people are slaves to our own vanity, more specifically, to our devotion to the conventions of style. One deplorable result of this devotion is the excessive heat from which men must suffer in the summer time. Literally an armor of cloth is worn over the body, which suffers intensely from poor air circulation and low evaporation.

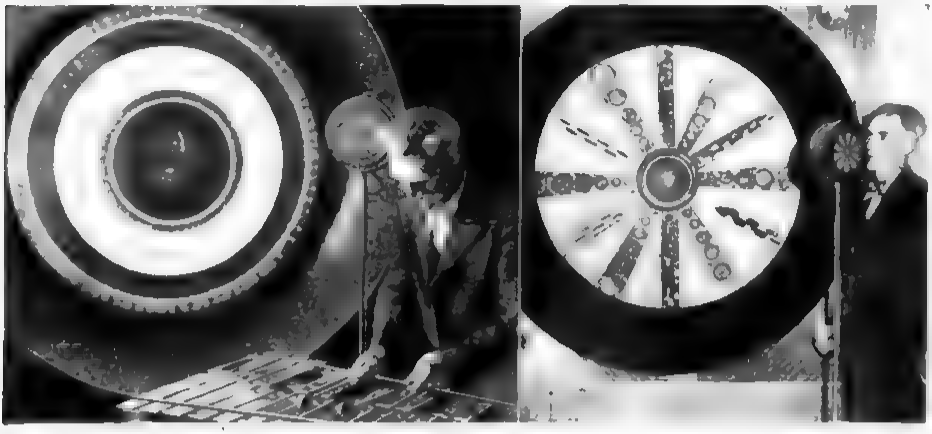
Engineers in the science of home air conditioning have conducted extensive research to determine the effect of clothing upon physical and mental efficiency. The first step was to find the relative weights of clothing worn by men and women during the summer weather. Men's clothing, it was learned, weighs on an average of six pounds, while women's apparel comes under one pound. This accounts for the greater comfort that women enjoy in hot weather.

Further research disclosed the fact that light tasks can be performed most efficiently at temperatures between 75 and 86 degrees Fahrenheit, provided proper air motion is afforded.



Why women enjoy greater comfort in summer time. Average "ensemble" weighs less than one pound, while men's "armor" of cloth weighs about six pounds. Such heavy clothing increases humidity, resulting in loss of efficiency.

"Colorphone" Changes TONES to HUES



Tones played on xylophone are picked up in mike and transformed into concentric circles of color as illustrated at left above. At right is seen Arthur Smith, "Colorphone" inventor, preparing to test voice, which is registered by various colors on disc.

EMPLOYING an instrument of his own invention, which has many principles of operation in common with the scanning discs now in use on television transmitters, Arthur L. Smith, of Los Angeles, has succeeded for the first time in expressing the "colors" of the musical tones in an instrument which he calls the "Colorphone."

When musician plays before the mike as demonstrated in the photo above, the instrument displays a series of concentric circles having colors corresponding to the tone. Though the most spectacular feature of the "Colorphone" is the display of rainbow colored hues, each of which represents one of the 88 tones within the scale of the instrument's sensitivity, it has a very practical application in testing the voices of singers. The slightest variation in tone will cause an immediate change of color in the rainbow-hued revolving disc.

Ants Like Humans in Many Ways

THAT the ant's nervous system may be much like that of man is indicated in a series of experiments conducted at the New York University. Proof of this is taken from the fact that an ant, like a child, can learn only one thing at a time. The simplest things given the ants to learn were more or less complicated mazes of passageways through which the ant had to go out to find food for the nest or to return after he found the edibles.

The difficulty in the learning process came in when the ants had to learn at the same time an inward and an outward maze. Confronted by the necessity of learning two things at once, all the ants undergoing the test became extremely confused and merely wandered about aimlessly.

Door Lock Operates Like Safe

A FAIR memory for a few numbers rather than a key is all that is required to unlock a door equipped with the combination doorknob and lock now available for home builders. The lock is opened by correct manipulation of the dial, just as you would open a safe door. Keys and keyholes are thus dispensed with, making it necessary to carry only the combination in your mind.

Numbers are tooled in the edge of the dial, as illustrated below.

Operating like safe, door locks when dial has been twisted on right combination. Keys and keyholes are eliminated.

Baby Carriage Unfolds to Carry Extra Child Passenger

Riding on telescopic axles, this baby carriage may be folded up into a one passenger vehicle, or unfolded to carry extra passenger as demonstrated in the photo above.

Blind People Can't Tell Lies

THAT blind people make the best witnesses and the poorest liars because they cannot see their own faces and do not know that their expressions give away their lies, was asserted by an eminent French scientist.

By looking at their own faces in mirrors and watching the expressions of other people, seeing individuals gradually learn to dissimulate and conceal emotions, whereas such artifices are forever barred to blind individuals who cannot see either how they look or how other people look under different emotional circumstances.

Thus they are precluded from practicing the arts of dissimulation and can only express naturally what they feel. It would for this reason be more rational to give greater weight in court to the testimony of blind witnesses than to seeing ones.

Ozone Speeds Healing of Wounds

A NEW method of treating wounds with ozone gas so that they recover more rapidly from germ infections has been introduced by medical men. In treatment a special electrical apparatus generates the ozonized air and directs a stream of it against the surface of the wound, ulcer, or other infection to be healed.

After a short exposure to the ozonized air the wound is covered with a germ-free dressing and let alone to heal.

HARASSED mothers with two or more youngsters to look after will find good use for a two passenger baby carriage which recently put in its appearance at a New York patent exhibition.

The double-barreled carriage, seen in the photo at the left, is the invention of Mrs. Ruth H. Chatfield, of Freeport, Long Island, who developed the invention probably out of necessity. It is a telescoping affair, capable of folding up into a single passenger vehicle, and unfolding to accommodate another passenger when the older child says, "Mama, I'm tired of walking."

Despite the width of the carriage, it has unusual strength, sufficient to transport two youngsters without excessive strain.

Maybe No Noise in Future Wars

EXCEPT for the bursting of high explosive shells, wars of the future may be comparatively silent affairs, thanks to a new silencer just perfected by Ronald Chapman, of Caterham, England.

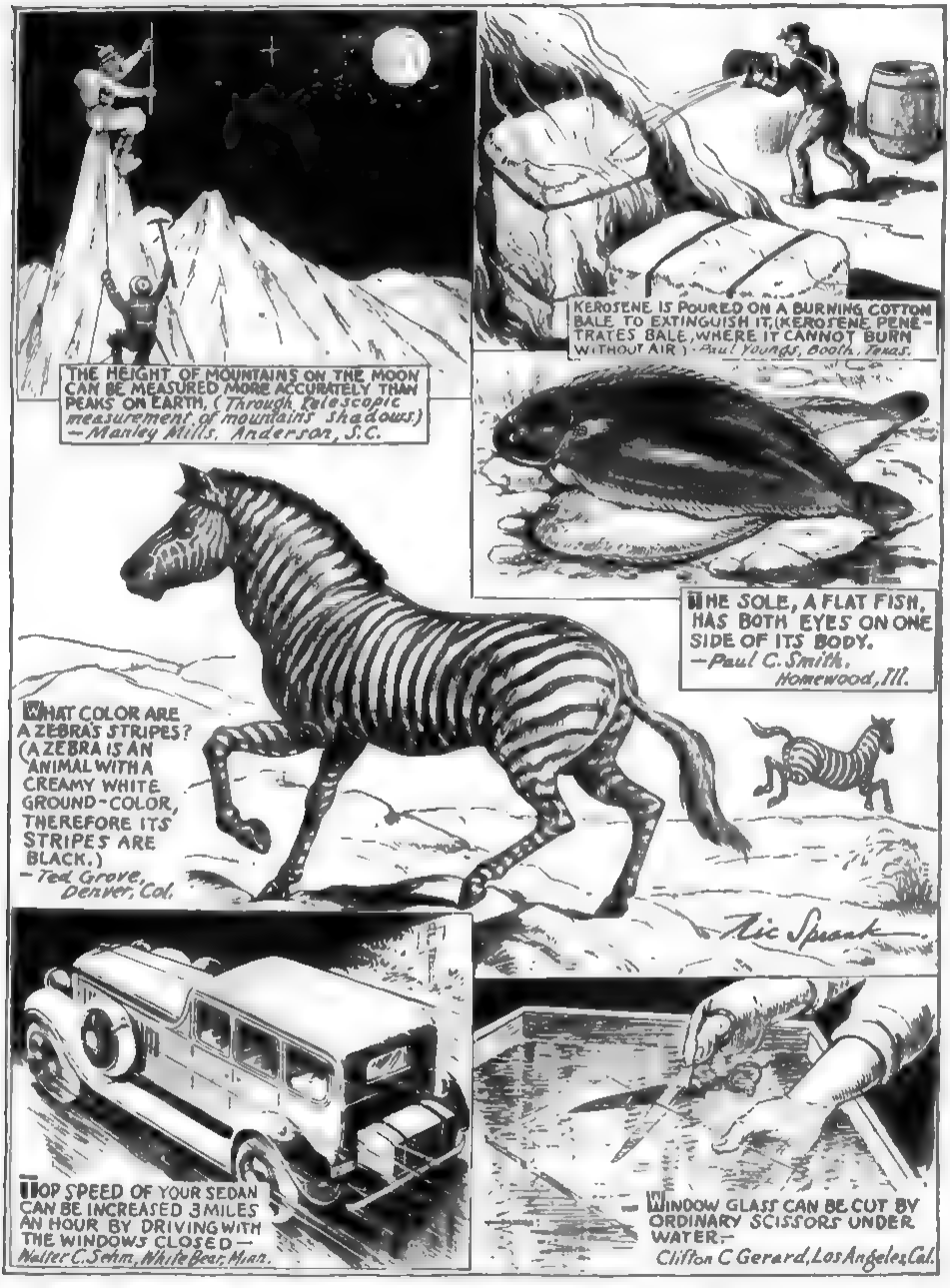
The silencer, which comprises a small cylinder about two inches in diameter and six inches long, fits onto the end of the gun barrel as demonstrated in the accompanying photo. The sound muffling mechanism which the inventor has not made known, absorbs more than four-fifths of the noise, and all flash and smoke.

With these qualities, the device becomes ideal for snipers and machine gunners in war time, and maybe use for it can be found in the gangster empire, where an "on the spot" job could be achieved with a minimum of disturbance to peaceful non-combatants.

This silencer on end of rifle, pistol, or machine gun barrel absorbs four-fifths of report and all of flash and smoke.

Oddities of SCIENCE

by NIC SPRANK



ONE DOLLAR will be paid by Nic Sprank for oddities of science used on this page. Send in your ideas—no limit to the number of suggestions you may make, but be sure to enclose proof of your statements. Maybe your ideas will be better than those shown on this page—if they are, Nic Sprank wants them and will be glad to send you a check. Address suggestions to Nic Sprank, care of Modern Mechanix and Inventions, 529 South Seventh Street, Minneapolis, Minn.

BALLOON RACING

by **WARD T. VAN ORMAN**
(Holder of the Gordon Bennett Balloon Racing Cup)
as told to Jay Earle Miller

Balloon piloting is the only racing sport in the world in which the contestants haven't the slightest idea where they are going. Moreover, they can never predict what will happen to them—whether they'll be lifted a mile a minute in a line squall, be struck by lightning, or come down in the middle of the Atlantic. The most famous of American balloonists here tells his own story of racing adventures.

Ward T. Van Orman, left, and his aide, Allen T. McCracken, taking off in their balloon. Note the sand bags, and pneumatic bumpers on basket bottom.

THIS coming fall—either on Sept. 25 or Oct. 8, depending on the weather—another Gordon Bennett International Balloon race will weigh off from Basle, Switzerland, and I hope to be there with another Goodyear balloon, trying for a leg on the new Gordon Bennett trophy, fourth in line of international lighter-than-air racing awards.

It took six victories in international races before I got the necessary three in a row and became the possessor of the third trophy. Two of my earlier victories, however, contributed two of the three legs by which the United States won the second cup.

My chance for getting that one was lost in that ill-fated elimination race at Pittsburgh in 1928 when twelve of the fourteen starters were either destroyed by lightning in air or forced down, all within an hour of the start, and my aide, Walter Morton, killed, as was Lieut. Paul Everett, pilot of the Army No. 3, from Langley Field.

Trains for Airship Piloting

Another army pilot, Captain W. E. Kepner, of Scott Field, won that race, and repeated in the international contest to win the cup for America, so between us Captain Kepner and I possess the second cup, and I have outright title to the third. Ernest De Muyter, the famous Belgian balloonist, won the first trophy, given by the late proprietor of the New York and Paris *Heralds*, and for whom the international race was named.

Ballooning, whether in the national elimination, the international race, or just for fun, is a great sport. But, more important still, it is an important contribution to the training of dirigible airship pilots. The two nations which have contributed the most to dirigible development—Germany and the United States—likewise have played an important part in setting free balloon records.

SPORT of SURPRISES

Balloons being inflated for a race. Note the hydrogen pipe-line in the foreground. The tiny black tips at tops of balloons are release valves through which gas is released when pilots wish to descend.

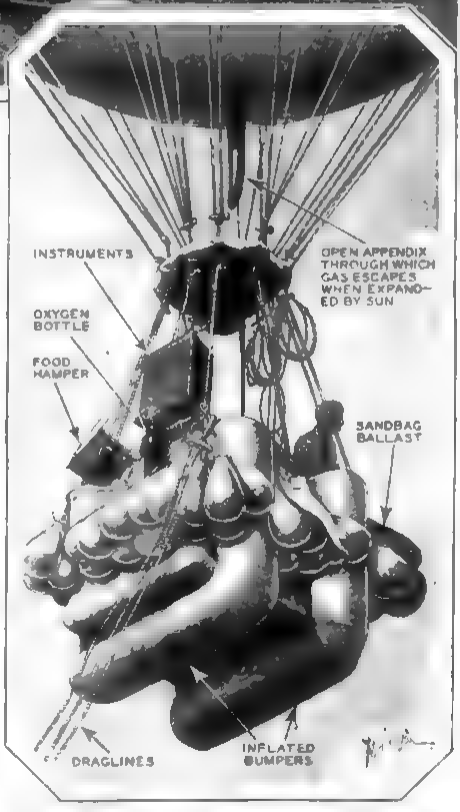
A German record, made between February 8th and 10th, 1914, by Hans Berliner and two companions, still stands as the world's free ballooning mark. They took off from Bitterfeld, Germany, and landed at Kiryischansk, in the Russian Ural mountains, approximately 1800 miles away. The American distance record of 1172.9 miles, set by W. R. Hawley back in 1910, still stands, though with C. K. Wollan as aide I came within 73 miles of equaling it in the elimination race back in 1924.

That 1924 national elimination contest which started from Kelly Field, San Antonio, Texas, had an unexpected thrilling end for Wollan and I. We came down near Rochester, Minn., 1,072 miles from the starting point, but were forced to land on the Chicago and Great Western railroad track.

Landing on an Ocean Liner

In the descent we tore down some telegraph wires and several poles, and both were somewhat bruised by the crash. Looking up we saw a passenger train coming around a bend several hundred yards away. We just had time to scramble out of the basket and flag the train, averting the destruction of the balloon and a possible train wreck.

I guess I have had my share of the thrills and adventures of ballooning. One of the most unusual was in the Gordon Bennett race from Brussels the following year. Nor-



Some idea of the maze of equipment carried in the basket of a modern racing balloon is given in this drawing. Much unseen equipment is carried inside the basket—parachutes, instruments, and provisions for use in forced landings.

Scores of Sandbags Hold Balloon to Ground While It Is Being Inflated

This is the first step in inflating a balloon—laying out the fabric, over which is stretched a net held down at its edges by numerous sand bags. The skeleton pyramid in the center is the release valve at the top of the balloon, operated manually by the pilot. Opening it permits gas to escape, and the balloon descends.

In this ascent Mr. Van Orman carried a pneumatic life raft, the direction of the wind indicating that he might come down in the Great Lakes. It can be seen in the rigging, just beneath the open appendix projecting from the bottom of the bag, through which gas escapes when expanded by the sun.

mally the general west to east trend of winds would indicate free balloons would drift eastward over Europe when starting from Brussels. That year bad weather brought a wind out of the northeast and the balloons were forced south and eastward across France.

Wollan and I made the greatest distance of anybody in the race—but we didn't win. Unfortunately we kept on going until we had left France behind and passed out to sea near Brest. With the whole Atlantic ocean to fall into, we sighted the liner *Vaterland* and made a perfect landing on her deck, without even wetting our feet or getting water in the basket. The committee, however, ruled that a dry deck landing didn't equal a dry land landing, so the prize went to De Muyter, who had covered 422 miles against our 441.18 miles.

Another crew in the same race, flying a Spanish balloon, wasn't as lucky as we were. They were forced down in the English channel, the balloon sank, and they swam for several hours before they were sighted by a ship and picked up. The crew of the English balloon *Elsie* had an even stranger accident. Flying low across Belgium their drag rope caught in a moving freight train and the balloon was dashed to the ground and wrecked.

Riding a Line Squall

The ill-fated elimination race at Pittsburgh in 1928 probably will stand in the records for a long time to come as the most disastrous day in ballooning history. Fourteen ships weighed off just before dusk and within forty-five minutes were in the midst of one of those violent line squalls which sweep across the Middle West so often in connection with summer thunder storms. The storm was exactly like the one that destroyed the navy dirigible *Shenandoah* not so many miles away in Ohio.

The Army No. 3 was struck by lightning, killing Lieut. Everett instantly, and his aide barely succeeded in landing the burning balloon. Walter Morton and I were caught in the midst of the storm and were helpless to navigate the ship. Violent ver-

One of Mr. Van Orman's closest shaves came when he and his aide landed on a railroad track near Rochester, Minn., just in time to flag a train bearing down on their balloon around a bend.

tical currents, rising and descending, whipped us up and down.

People who marveled that the *Shenandoah*, with a length of only a few hundred feet, could have been caught in different air currents and torn into three pieces, should have been along with us to see what a line squall is really like. Once when we were being forced downward at tremendous speed we passed Captain Kepner and his aide so close that Lieut. Erricssen called across to us. At that moment we were going down, probably at a speed of better than eighty miles an hour, and they were going up just as fast.

An 80-Mile-an-Hour Descent

We touched ground at the bottom of that descent and bounced upward at terrific speed. How high we went I shall never know, though I estimate it was at least 1500 feet. It was then the lightning struck us, killing Morton and stunning me. I owe my own life to the fact that from then on I was unconscious, and utterly limp.

We fell, examination later showed, at terrific speed, striking the ground with such an impact that the bumpers under the basket were crushed and even cans of food in our stores telescoped to half their length. In spite of that crash I got out with only a broken leg—all because I was unconscious and completely relaxed at the moment of the impact. Besides the death of Morton and Lieut. Everett, James F. Cooper, aide in the *City of Cleveland*, was struck by lightning but lived. Altogether there has never been such a series of misfortunes in one race, and it is probable that there never will be again.

For, as a result of that experience, we began experimenting at the Goodyear plant with means of lightning protection for the crew, and finally evolved a system of metal guards which seem to have removed all possibility of lightning ever again injuring a passenger in a balloon protected with the system.

A bag of sand ballast is being attached to the bag by Mr. Van Orman. Sand is used because of its weight, and the fact that it can be sprinkled out without endangering people on the ground.

Modern Methods Different

Balloon flying in the modern manner is quite a different thing from what it was in the early days. Efficient parachutes, radio weather reports, plenty of oxygen for use at high altitudes, lightning protection and more knowledge of the upper air currents

have removed many of the dangers. It continues, however, to be a fascinating and thrilling sport.

Since the war practically all balloon racers have carried oxygen tanks and masks for use above about 14,000 feet. Much of modern racing is done at altitudes above 20,000 feet, in search of stronger and more favorable winds, and at that height all but a very few people must have an artificial supply of oxygen to keep their full strength and wits.

Why Races Start in Afternoon

If a balloon can get away with a heavy load of ballast and a full bag of gas and reach a high altitude the first night without too much sacrifice of sand, it stands an excellent chance of winning a race. A strong and steady wind during the first night, before the gas has been expanded by the sun and much of it lost, is the most important thing to a balloonist. That's why races always start in the late afternoon, when the sun's rays are low and a maximum of gas can be placed in the bag.

By the time a racing balloon is inflated and rigged for a race there is little room for the two pilots in the basket. Radio, radio batteries, loud speaker, oxygen flasks, barometers, thermometers, other instruments, parachutes, sand bags, food, spare clothing and a dozen and one other things take up every possible spare inch. In fact, in the early stages of a race it is often more comfortable riding on the rim of the basket than it is inside.

A Test of Skilled Piloting

The coming international race at Basle should be an interesting experience. Situated only 909 feet above sea level, in a country the greater part of whose area towers thousands of feet into the air, a start from Basle, unless the weather is just right, will call for all the skill the pilots of a half dozen or more nations will have to offer.

The start will be from that narrow throat of the Rhine valley, just before it opens out into the broad reach that carries it northward into Germany. The wide valley will be hardly a dozen miles away, and if the wind is from the south the gas bags should get into the valley region without trouble.

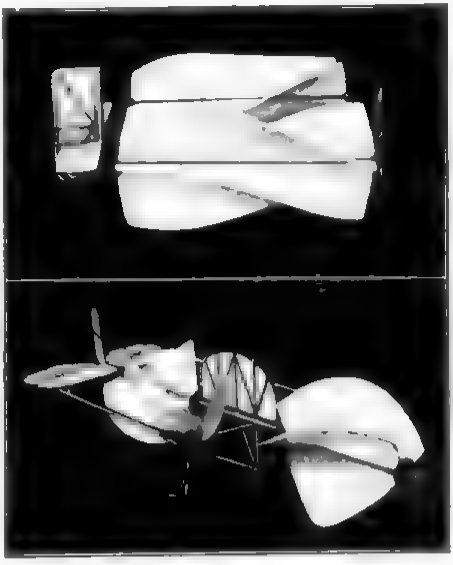
A wind from any other direction except out of the east will offer difficulties, with the high wall of the Alps to be surmounted within a few hours after the take-off. The prevailing custom of the winds in the mountains, however, is to flow up the peaks at night and down in the morning, so if the bags should be blown towards the mountains they probably will be able to get over them.

Distance Depends on Conditions

Fortunately the climatic conditions of Switzerland have been carefully charted for many years, and there is probably no area of similar size anywhere where more is known about what may be expected at various heights.

(Continued on page 146)

Here's Latest in Freak Planes



Here's latest in freak planes. Wings are built in groups of four or more attached to a hub with 90-degree helical curve.

FREAK planes seem never to cease. The latest is the thing shown in the photo above. Bearing a close resemblance to an airplane designer's nightmare, the machine is claimed to give heavier than air craft more longitudinal and lateral stability and a larger safety factor in making landings without power. The wings are built in groups of four, attached to a hub with a 90-degree helical curve.

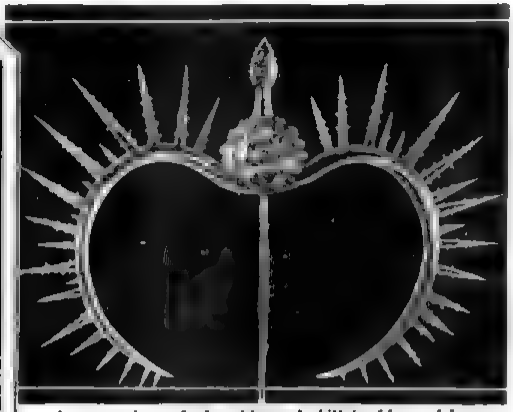
Thermometer Has Dial Like Clock

EQUIPPED with a dial face, as shown in the photo below, a new thermometer just placed on the market bears a close resemblance to a clock. The device seems to work anywhere, for it is just as much at home submerged in a bath tub as when decorating a mantelpiece. Of very light construction, it is claimed to be foolproof.

Thermometer may be submerged in water without damage.

Microscopic Marine Life Modeled in Glass

Most startling among the "Miracles in Glass" is this model of a radiolarian, a microscopic animal of the tropical seas.



A masterpiece of glass blowers' skill is this model reproduction of sea protozoan, resembling king's crown. Note delicacy of the spines

Here is H. O. Mueller, a glass blower of rare skill, with some of amazing models he has turned out for American Museum of Natural History. He uses ordinary glass and his only tools are a pair of tweezers, a carbon pencil and a gas blow torch.

"MIRACLES in glass" is the most appropriate title to be applied to creations of H. O. Mueller, whose job with the American Museum of Natural History is to reproduce in glass the microscopic creatures found in drinking water and in the ooze from tropical seas.

In working out these amazing reproductions, artist-scientists first make about two hundred separate drawings of the invisible marine animals through high-power microscopes. From these drawings Mr. Mueller then builds up the model section by section, using as high as 2000 pieces of glass for each subject. His only tools are his gas blow torch, a pair of tweezers, and a carbon pencil.

A few of the models are shown above.

Pasted Silken Tissue Sheets Preserve Newspaper Pages

Newspaper pages are preserved against ravages of time by pasting over them a layer of thin, transparent silk tissue, which excludes air but permits the words to be easily read.

SO THAT centuries to come may have a vivid day-to-day record of events of our contemporary history, the department of printing and binding of the New York public library has developed a preservative to protect filed daily newspapers against the ravages of time.

The method employed makes use of two sheets of very fine silk tissue pasted on both sides of the newspaper pages. The photo at left shows a worker applying the paste. With the silk tissue in place, the paper is protected against air, but the words may be plainly read through the transparent material.

When the individual pages have been treated, the entire paper is then filed away in the usual manner, so that it will be accessible to historians of even the remote future.

Beware of Scurvy in Depression

OWING to restricted food supply which is being forced on millions of people, one of the results of the present depression might be the increase of scurvy, a disease which frequently occurred among sailors who made long voyages on sailing ships.

Experience indicates that economic conditions always bring on an increase of scurvy because of the shortage in the diet of fresh vegetables and other foods which contain the valuable vitamin C. It's advisable to concentrate on oranges, apples and potatoes.

Theatre Design Cuts Eye Strain

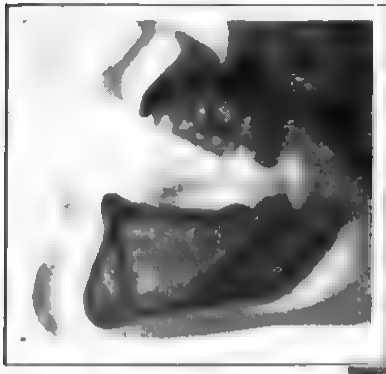
AN entirely new idea in motion picture theatre construction has been applied in a modernistic little theatre which was opened to the public recently in New York.

Built to accommodate the special requirements of the cinema instead of being modeled after the conventional requirements of the legitimate stage, as is the case in other movie houses, the outstanding feature of the theatre is what is known as the parabolic floor. With this method of construction, the floor rises up to meet the screen instead of slanting downward.

With the parabolic floor, architects claim, greater comfort and diminution of eye strain are provided to patrons. Acoustical qualities are also greatly improved.

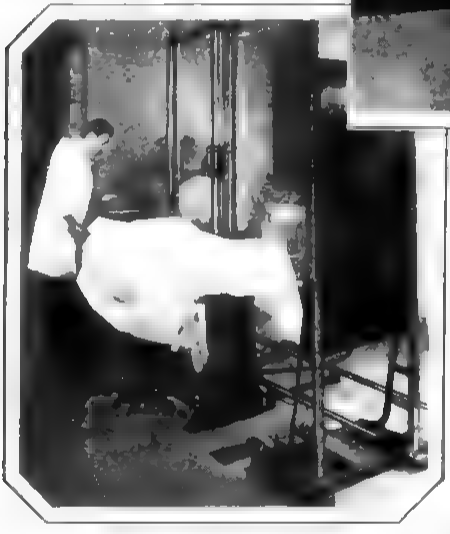
Eye strain is diminished and comfort greatly increased by this new theatre design. Parabolic floor rises up to the screen, instead of slanting downward, an arrangement found far more satisfactory for viewing cinema productions in theatre.

X-Ray Tells if You're Grand Opera Star



In seeking source of carrying power of voices of great singers, scientists made X-rays of jaw and other parts of head.

To determine source of resonance in singer's voice, scientist is here testing frontal sinuses with the sonometer, an instrument which measures the energy of each tone, no matter what the pitch may be. Nasal passages, larynx, windpipe, etc., are likewise tested. Meter shows tonal energy.



Here is X-ray machine at Carnegie Institute ready for making photograph of singer to determine what role lip, tongue, larynx, windpipe and other organs play in the singing process. Exposures are synchronized with sound records.

IS THE time drawing near when science will be able to devise an almost mathematical formula for making great singers out of any aspirant to musical fame? Is there any way to determine the precise physiological differences in vocal organs and other parts of the body which might account for good, bad and indifferent singing voices?

An attempt at answering the questions is being made by scientists, who have made X-ray exposures, during the actual act of singing, of the throats and heads of such famous opera stars as Lawrence Tibbet, Benjamin Gigli, Reinold Werrenrath, and others of vocal fame.

One of the distinguishing qualities of every good singer is the resonance, or carrying power of his voice. To determine the source in the anatomy of this quality scientists have developed an instrument called a "sonometer," whereby the energy or carrying power present in the tone as it is emitted from the larynx, as well as its strength when it comes in contact with the head, nasal and chest cavities, may be measured.

What Are Resonating Organs?

Examination of the nasal passages, the head cavities, the lungs and the wind pipe proved that these organs could not be the source of the resonance. The nasal passage could accentuate only a single pitch; the sinuses of the head cavities do not have openings large enough for them to act as resonators; the walls of the lungs are too spongy to act as baffles for resonators; the wind pipe stood as the only possibility.

The tests left the scientists in a quandary, but they have made an outstanding contribution in the definite proof that nasal and bony head cavities do not in any way function as resonators, although no doubt these organs do play an important part as tone modifiers.

In testing out Gigli, who is famous for the carrying power of his voice, the sonometer showed greater loudness of tone when contact is made over the larynx than over the frontal sinus or nasal bridge. Werrenrath yielded similar results.

The STEAM CAR is

One of the oldest autos in America—built in 1891 by M. Pheleia, this novel steam car can still do about eight m.p.h. with a two-man crew.

The steam-powered automobile, put out of the running by its gasoline rival years ago, is all set to stage a comeback in popularity. Well-financed companies are planning the production of steam cars and buses whose economy of operation, simplicity of control and other known advantages over the gasoline cars are expected to re-establish them in general favor.

AFTER twenty years during which it has been regarded as a back-number in a class with the one-hoss shay, the steam-driven automobile is at last staging a comeback which threatens the long-established popularity of the gasoline car.

Several companies are actively at work in the production of steam cars, which will first be in the form of buses and trucks, later branching out into the pleasure car field. Steam has always been recognized by engineers as having numerous advantages over the internal combustion type of engine used in present-day cars.

Perhaps you remember fantastic tales of steam cars and their accomplishments. There was, for instance, the manufacturer who offered a free car to anyone who could hold the throttle open for fifty miles. There is no record of any daring soul ever accepting the challenge.

Builders of the Stanley steamer posted $5000 at the Indianapolis speedway that their specially constructed steam racer would beat any internal combustion car in a distance race. They found no takers. Unconquered engineering problems did their bit to shove the steam car into temporary oblivion, but these difficulties have now been overcome.

What are the advantages of steam? It gives, smooth, rapid acceleration to a degree not obtainable in gasoline engines. There is no clutch or transmission. The double-acting steam cylinder gives two smooth power strokes to each revolution, while the four-cycle gasoline motor has one power stroke to each two revolutions.

The engine makes but 750 revolutions at 50 miles an hour, compared to 3000 for the usual internal combustion motor. Expanding steam in a cylinder gives a complete power push to the piston head for the full stroke. The gasoline engine gets a power impulse on its piston only at the instant of explosion in the cylinder.

Will Your Car Do This?

Operate without a clutch or transmission?
Climb the steepest grade without shifting gears?
Operate without engine noise at all speeds?
Start without cranking or using a starter?
Get constant power application without a flywheel?
Accelerate from a stop to 50 m.p.h. in 100 yards?
Run a mile for .017 fuel cost?

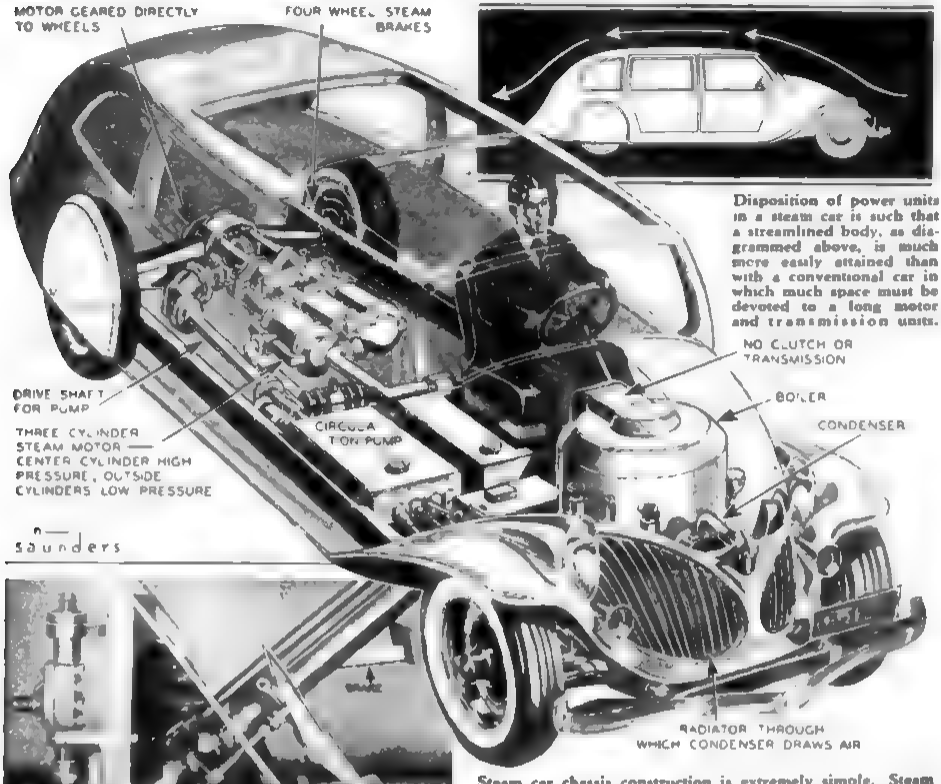
A STEAM CAR WILL!

These are some of the factors which have kept the steam car idea alive in the minds of engineers since Cugnot made the first self-propelling vehicle in 1770. His three-wheeler, boiler and seat "road locomotive" was a far cry from the luxurious steam car slated for production this year, but it worked, developing 2¼ miles an hour.

In 1839 steam cars were established with fair success in England, a man named Hancock

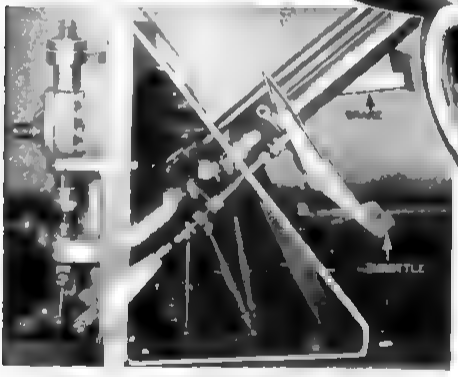
Coming Back!

by RALPH DAIGH



Disposition of power units in a steam car is such that a streamlined body, as diagrammed above, is much more easily attained than with a conventional car in which much space must be devoted to a long motor and transmission units.

Steam car chassis construction is extremely simple. Steam is generated in boiler, carried back to three-cylinder engine geared directly to wheels, pumped back to condenser where it is returned to water ready for another power cycle.



Only two controls are needed by the steam-car driver—brake and throttle. The accelerator, operated with left foot, occupies the position of the clutch pedal in a gasoline car.

developing a 3½-ton omnibus for London operation that developed 20 miles an hour under ideal conditions. Excessive road tolls and legislation demanding that a crier run before the car and wave a red flag, so the citizens might flee to safety, soon forced the bus to be discontinued.

Not until 1889 was the steam car revived again. Serpollet of France developed a flash type of boiler heated by vaporized fuel. The idea was eagerly received in this country and Stanley, of Stanley Steamer fame, went to work in earnest. In 1900 Stanley was able to get 14 miles from a gallon of kerosene. Proof that the steamers satisfied engineering requirements of the day is found in the fact that the first automobile bought by the United States government was a Mobile steam car.

Boiler Supplied Hot Coffee!

The new car electrified army officials and tacticians. Extravagant speeches were made and it was prophesied that the whole course of warfare would be changed now that "troops could be moved one hundred miles over broken prairie country in a day and arrive for combat as fresh in body and spirit as when they started." Neither was the comfort of the soldier riders neglected. A faucet was attached to the boiler that hot water might be drawn off for coffee en route. In this ultimate of comfortable transportation, however, the driver steered with a tiller and the designer neglected to include serviceable springs.

From 1900 to 1915, steam cars of Doble, White and Stanley were recognized com-

petitors of the gasoline driven automobiles. It is estimated that five hundred of these cars are still running.

Strangely enough, the problems confronted in developing the steam car were not as great as those conquered in perfecting the popular gasoline engine of today. But, until now, the gasoline cars have won the race, and it is only because of recent developments and the inherent value of steam power, that financial and business powers have been persuaded that steam is the answer to economical automotive power.

Problem of Sufficient Steam Solved

The biggest problem met and not conquered by the White, Stanley and other steamer people was in keeping a sufficient head of steam under hard pulling conditions.

The flash boiler, while having the advantage of quick starting, added to this difficulty. It had many fire tubes but not enough water space.

The uniform application of driving force as applied by the powerful steam pistons would send the old steamers up a steep hill like a scared cat—unless the hill was too long. Then the steam pressure would be dissipated. It was sometimes necessary to stop on the hill while additional steam was generated.

This difficulty has been overcome by giving a hotter fire to a greater quantity of water.

Another problem was the elimination of side drafts on the boiler. This—and unsatisfactory insulation for the boiler—tended to cool the steam with a resultant loss of power. A complete and insulated enclosure for the boiler has remedied this.

Another big drawback in the older cars, and one that contributed more to the unpopularity of steamers than any other one factor, was the amount of personal attention needed in tending the fire, regulating the water level and keeping a safe head of steam.

A recently discovered thermostat metal—developed by General Electric—has proved positive under all conditions. This new metal (it is really two metals fused at a high temperature) permits the automatic and fool-proof adjustment of water level, steam pressure and fire temperature. This thermostat metal is standard in all modern thermostatic appliances for room temperature control, etc.

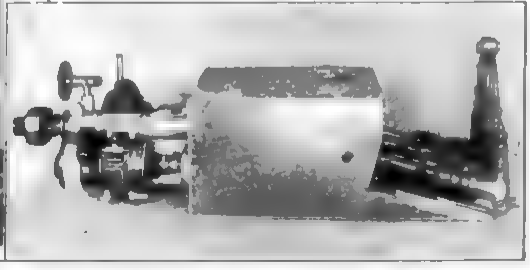
Starts in 30 Seconds

Another detriment involving the personal element was the slow starting of the early cars. Some of them required that the boiler or pilot flames be lighted by hand. It was considered enough if the car was ready to travel within an hour and a half after the fire was lighted. Stanley and White both perfected electric automatic lighting devices for the pilot flame that made delay unnecessary when a flash boiler was used. A minute and a half sufficed to get a good power surge from a cold motor. Thirty seconds was enough to generate a working head of steam if the boiler was warm.

Fuel Costs but $.017 a Mile

Fuels being used by steam cars in this country are chiefly three: kerosene, fuel oil and a mixture of gasoline and kerosene. In England and France trucks are running on these fuels as well as on coke, coal and even wood. The last three have not proved satisfactory. The Steam Motors vehicle is giving satisfactory results on fuel oil.

The economy of any of the three main fuels as compared with gasoline is apparent. Figures released by the Steam Motors Company show a fuel cost of $.017 per mile. The trucks are conservatively estimated to be fifteen per cent more economical from the standpoint of all costs (including origi-



At left, steam turbine and condenser on car now running. Steam enters through tube running diagonally at lower right, turns fan, exits through tube at top, passes through radiator, condenses to water, and is returned to boiler through pipe with two right-angle bends. At right is shown a photo of the pump unit and generator for starting equipment.

No Noise, Ease and Economy of Operation, Factors Favoring Steam Car

This photo shows the last Stanley steamer, built in 1916, which compares favorably with present-day car body design.

nal cost, upkeep and operating expense) than gasoline driven vehicles of comparative size.

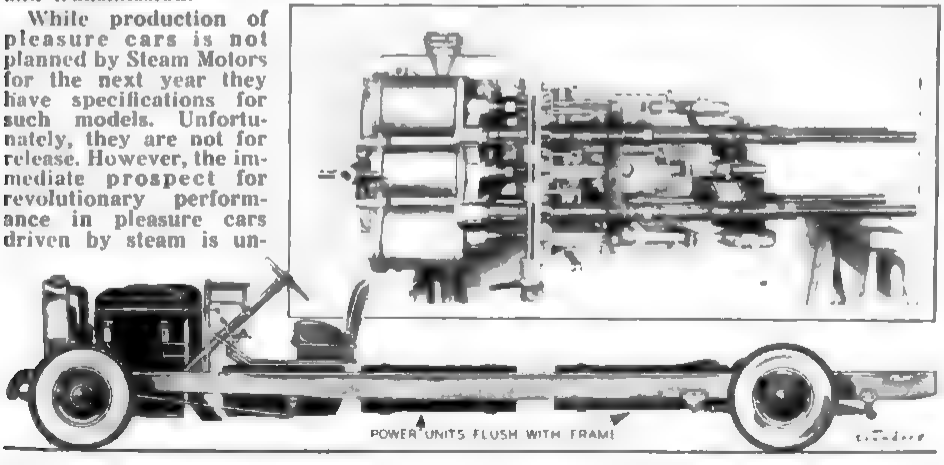
At the present time Steam Motors is concentrating on truck and bus jobs. The one hundred twenty cars they manufacture in the next year will be of those two classes. Not wishing to advance too fast with a product that could not be properly serviced by today's garages and mechanics they will concentrate on supplying maintained and supervised fleets where economy is of prime importance.

The engine of the Steam Motors truck weighs 700 pounds. The boiler and burner bring this up to 1600 pounds for the heavy truck. A comparative gasoline driven truck has over 2200 pounds in engine, flywheel and transmission.

While production of pleasure cars is not planned by Steam Motors for the next year they have specifications for such models. Unfortunately, they are not for release. However, the immediate prospect for revolutionary performance in pleasure cars driven by steam is unlimited, according to Mr. L. E. Rightmyer, Steam Power Corporation of America, and formerly with the Stanley people.

Bodies Can Be Easily Streamlined

"Modern development of the steam car idea has so condensed the machinery required that a diligent engineer can fit all the power plant and drive mechanism between the longitudinal members of the chassis. This means that body designers will strike new notes in body designing. There is no necessity for a cumbersome hood. The forepart of the car can also be designed according to the best streamline principles with no consideration for the engine, which is directly connected with the rear axle and under the body of the car."



Side view shows how power units fit flush with frame, permitting wide latitude in body design of steam car. Insert photo shows three-cylinder steam engine, in which center cylinder is high pressure, the outside cylinders low pressure.

New Aquatic Thrills in This Non-Sinkable Surf Sled

Olympic safety surf sled has air-tight compartment to prevent sinking, and stabilizer for riding behind speed boat.

WHAT'S new in the world of aquatic sports? What's new is an "Olympic safety surf sled" designed and introduced on west coast beaches by Bill Wheeler, Los Angeles newspaper artist.

Shown in the photo at the left in possession of a fair watersports enthusiast, the sled is constructed of light-weight wood weighing something like nine pounds. A feature of this sled is an air-tight compartment which makes the device capable of supporting weight of average person.

For surf riding behind a speed boat a special aluminum stabilizer, which acts as a rudder, is provided, so that there is little danger of wabbling on the water course.

Safety Sense Stops Home Injury

ACQUIREMENT by modern housewives of an automatic "safety sense" around the house, like the "road sense" of experienced motorists or the "air sense" of aviators, was urged as increasingly necessary to home safety at the National Safety Congress in London.

Approximately 1800 women are killed every year in British homes by falling down stairs, off furniture, over rugs or by some other kind of household accident involving a fall.

1932 to be Bad Hurricane Year

PREDICTIONS made many months ago by Herbert J. Browne, long range weather forecaster of Washington, D. C., that 1932 would be a notable hurricane year, are already beginning to come true. Several typhoons have already occurred in the Pacific, another in Indo-China, and others in Bengal and in the Indian Ocean.

No Spoiling in Milk Container

Milk won't freeze or spoil when placed in this container.

MILK delivered in the small hours of the morning sometimes spoils or freezes before it is taken in by the housewife later in the day, but this loss is eliminated by the employment of the vacuum milk bottle protector shown in accompanying photo. The container has a capacity of three bottles. Top and bottom are protected by an insulating layer of Celotex.

Lighted Umbrella for Pedestrians

Flashlight built onto handle of umbrella serves as convenient head light for pedestrian on dark, stormy nights.

WHAT amounts to a head light for pedestrians carrying an umbrella on a dark and stormy night was displayed at the International Patent Exhibition held recently in New York.

A regular flashlight is built onto the end of the umbrella handle, as shown in the photo above, and is controlled by thumb.

Directory Kept Always Handy in Door of Phone Niche

A TELEPHONE directory is one of those things that are always in demand, and always in the way when not in demand. With a view to providing a convenient housing for the book, so that it would always be available yet out of the way, an inventor has designed a special cabinet which not only makes a home for the book but also makes a neat little piece of decorative furniture.

The cabinet fits in a niche in the wall, as illustrated at the right, and has a door with a small receptacle to take the book. The phone sits on the top of the cabinet, while the bell box is stowed away at the bottom.

Phone book is kept easily accessible but out of the way.

Pole Moving South 7 In. Per Year

THE north pole is moving south at a rate of approximately seven inches a year, according to scientists of the U. S. Coast and Geodetic Survey, who believe that the possible cause is some slight change in the shape of the earth originating in the interior, thus shifting the polarity of that body. At this rate of change the pole will move southward at a rate of one mile every 12,000 years. Thus our climate will be affected to only a very small degree by the shift. It is possible that changes have oscillatory motion over geographic pole.

Police Improve Marksmanship by Bursting Toy Balloons With Pistols

BOSTON coppers have devised an extremely clever target range on which to develop expert marksmanship. As shown below, the range has an inclined steel plate set along the ground, while in front are ranged a row of toy balloons.

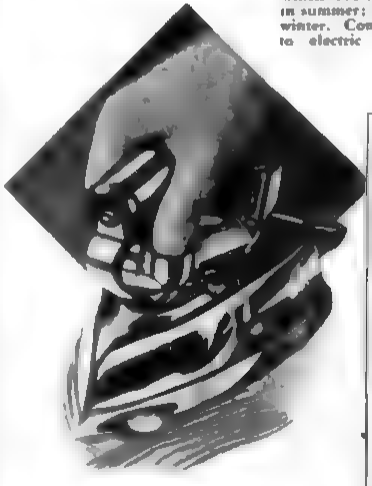
The coppers out for practice stand back at about fifty paces and let fire at the balloons, which sway in the breeze to keep the marksman's nerves alert. The record is three balloons in about four seconds, during which time the policeman empties his six gun into targets. Mowing down the balloons with a "chopper" is fine practice.

Boston coppers get target practice by bursting balloons strung along in front of steel plate. Mowing down the balloons with "chopper" develops good marksmanship for use when dealing with gangsters. Record is three balloons in four seconds.

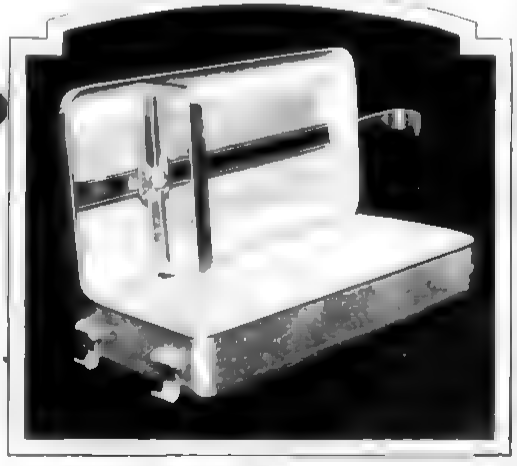
EIGHT NEW INVENTIONS

Last word in home comfort is represented in new unit type air conditioning equipment, shown above, which cools and dehumidifies air in summer; heats and humidifies in winter. Conditioner is connected to electric and heating system.

Diners who like their eggs cooked to precisely the right minute will appreciate this automatic egg cooker which has timing device in the cover that sounds a shrill whistle at the moment desired. Cooking period is set by knob with pointer and eggs are boiled in the container.



This electric iron now on market has slots or "button nooks," on each side of front part of iron into which button fits during ironing to prevent breakage.

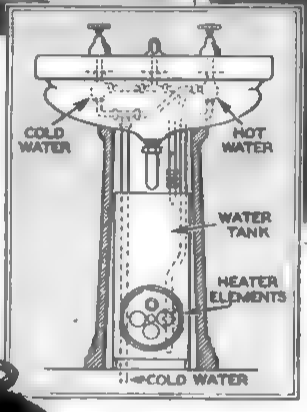


You can make ice cream in your electric refrigerator with this "Cremefreezer" which fits in freezing compartment.

Modern Mechanix and Inventions Editors Will Furnish You With

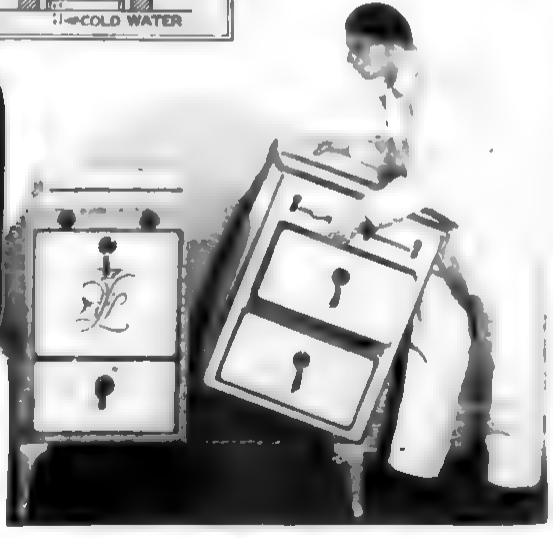
for HOME CONVENIENCE

Introduced particularly for use by dressmakers, tailors, etc., are these unique scissors which have serrated edges to cut and pink cloth in one motion. Formerly the goods was run through a machine or done by hand with ordinary scissors, necessitating hours of tedious work, whereas these shears perform the entire job with minimum ease, saving time, labor, material and money.



Hot water pipes are eliminated by this washstand with built-in electric water heating element. Drawing shows immersion-heater and thermostat in base. Connects to house current.

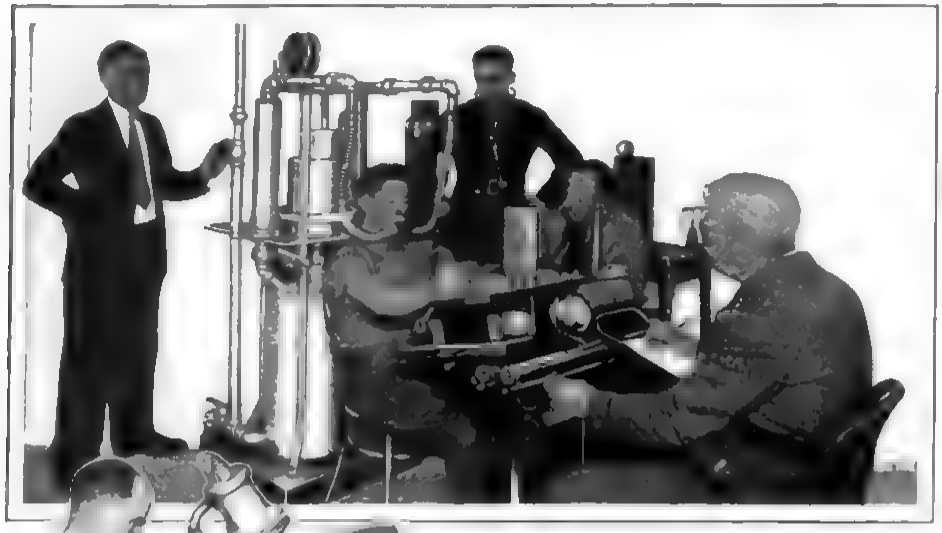
Ideal for home, for parties—for any gathering where soft drinks are in demand is this carbonated beverage dispenser. Five-gallon container has special top with spigot and pressure meter. Natural drinks are charged in container with carbonic gas generated by small cylinders of dry ice.



Latest in gas stoves is this reversible table-topped gas range having oven section, burner section, and leg base in separate units

Addresses of Manufacturers of Household Aids Shown on These Pages

How UNCLE SAM Picks



High altitude flying conditions are reproduced by this device. The applicant's reactions are studied while he breathes air of varying densities, determined by examiner.

This device tests range of vision—that is, how much can be seen out of corner of eye. Pilots need wide range.

by **WILLIAM D. and EDWARD B. COPE**

Only the most perfect physical specimens can pass the rigid tests which Army doctors have devised for aspirants to the Air Corps. Scores of elaborate machines, ranging from those which reproduce high altitude conditions to complicated devices for measuring speed of reactions, tell the prospective pilot whether or not he is physically fit to deal with problems which the flyer must solve instantly.

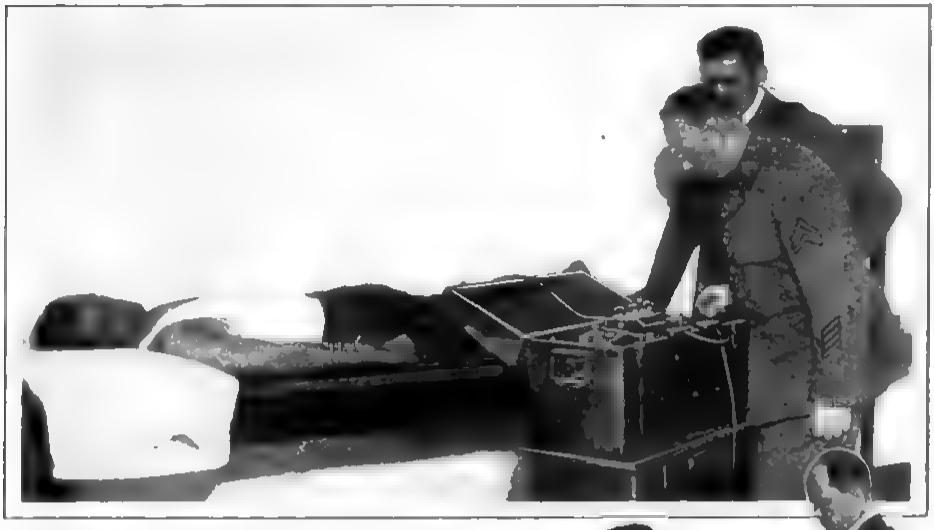
STARTING with a third degree-like personality test, young men who aspire to be Army flying cadets are whirled, twirled, rapped, tapped, run, spun and blasted through a hectic four-hour route beset with operating tables, whirling chairs, pulleys, levers and gadgets. Thus the would-be aviators—those lucky enough to pass the ordeal—rightfully earn their title of "the pick of the nation."

The most rigid physical and muscle-correlation examinations yet devised are meted out to those young Americans who seek admittance into the Army Air Corps' Primary Flying School, "the West Point of the Air," at Randolph Field, Texas. The tests, as conducted by the flight surgeons at Randolph, are so strict that less than half of the graduates of a recent West Point class who applied for entrance were able to make the grade.

Requirements for Eligibility

"Some parts of the examination require much more time than others, but one part is as important as the other," explained Major Benjamin B. Warriner, commandant of the School of Aviation Medicine where the examinations are given. "Like the clock which stops if something goes wrong with only the screw which holds the hairspring

His ARMY FLYERS



Involuntary movements of the nervous system are accurately registered on the recording tape of the electro-cardiograph machine, which also registers pulse of prospective pilot.

in place, so the slightest defect in the make-up of the flyer may cause trouble at a critical moment."

Before being eligible to take the physical examination, however, the flying cadet aspirant must satisfy other requirements: He must be single, not over 27 years of age, have no dependents, have at least two years of accredited college work, and furnish three character references.

Prospective flying cadets are thoroughly examined at the field nearest their homes. Soon after their arrival at Randolph they are given a general physical recheck and personality quiz.

Special Attention to Eyes and Ears

A steady bombardment of scores of questions, some of which are very personal, characterizes the personality test as given to prospective flyers. During the course of the neuro-psychiatry examination, which lasts from 45 minutes to an hour and a half, depending on the discussion given the various questions, the flight surgeon writes the answers in a multipage questionnaire. All cadets are asked the same set of questions.

Seated on opposite sides of a huge oak desk, the quizzer and the quizzed discuss such questions as the following:

What book did you read last? Do you have a sweetheart? How were you punished as a child? Do you make friends easily? Does your mother get angry easily? What is your goal in life? Would you rather go to a show alone, with another fellow, or with a girl? Why? Has your father always been a pal to you? What is the earliest thing you can remember?

Color vision is tested by the Jennings color chart, in which bits of wool of various hues are selected by the examinee.

Frankness, above everything else, is sought in the answers of the flying cadets, although speed and confidence are also considered vital factors.

Since the pilot is so dependent upon his eyes and ears, these organs are given precedence over all other physical faculties. The first test given the eyes is a comprehensive recheck similar to the examination already passed before coming to Randolph. The prospective flyer is next whisked through a labyrinth of instruments intended to find any possible defect in the vision.

The field of vision test, measured by a

Reaction Time, or Speed in Obeying Commands, Measured by Device

In the automatic serial reaction machine test, the would-be flyer faces three panels of red and white lights, as shown in the photo above. Certain of the red lights are flashed on without warning, and the applicant is required to flash on the corresponding white lights by means of rudder and stick controls similar to those on an airplane.

Degrees of sound which the applicant is capable of hearing are tested with this audiometer. Ears and eyes are most important to a flyer to safely pilot his airplane.

graduated half-moon shaped machine, determines the greatest angle at which the candidate can literally, "see out of the corner of his eye." Perception of depth probes the applicant's ability to align two upright sticks within 2.5 centimeters of each other at a distance of eighteen feet, by means of pulleys and cords. The internal muscular structure of each eye is thoroughly examined by the flight surgeons.

Employing the Jennings test chart, the last word in discovering color blindness, the results of the central vision color vision examination are noted. The angle of convergence check determines the examinee's degree of voluntary "cross-eyedness."

Audiometer Tests Hearing

To climax the exacting test made upon the would-be flyer's ears, the most necessary organ to the pilot, with the exception of the eyes, the audiometer is called into use. A pair of head phones, not unlike those used during the early days of radio, are firmly adjusted over the ears. The flight surgeon controls the volume of sound emitted from the audiometer, testing each ear separately, and together.

The "wobbleometer," a device designed to test the student's ability to balance himself, consists of a small platform balanced on a pivot on which the subject stands with closed eyes. Each time the cadet loses his balance, the platform touches the baseboard, and makes a mark on a tape. In addition to checking the wingless birdman's sense of equilibrium, the "wobbleometer" shows the relative fatigue. The number of marks on the recording tape is in direct ratio to the student's fatigue.

Reserve Physical Strength Measured

Reserve strength of the would-be airplane pilot is determined through a series of heart-action and blood-pressure readings known as the Schneider test. In the course of this checkup, heart and blood pressure readings are made while lying, standing, and after exercising. The relation of these measurements is called the Schneider index, and is constructed as a "yardstick" to the subject's reserve strength.

"Wobbleometer" Test Measures the Sense of Balance, Vital to a Flyer

Conditions of rarefied atmosphere are controlled on the altitude test tank to correspond with actual conditions of high altitude flying. The subject breathes through a tube connected to a tank in which the oxygen content is slowly reduced. The rarefication continues until the flight surgeon detects sporadic pulse. If the student has "ascended" 12,000 feet or more, according to the accurate altimeter on the machine, he has passed the test, and is advanced to the next phase of the examination.

Reactions Measured in Hundredths of a Second

The "old stand-by" of the Army aviation tests is the whirling chair. The applicant is required to keep his eyes closed and attempt to point the direction in which he is turning, and also indicate when he is stationary. Simple as the test seems, it is very effective in determining the sense of direction when in motion.

With the sensitized plate bound to his forearm, the flying tyro's involuntary movements of the nervous system are accurately recorded, as is the pulse, on an electrically-actuated tape of the electro cardiograph.

An instrument so exacting that it measures to one-hundredths of a second the speed of muscle response, is the complex co-ordinator. In a test on this machine, the student sits in front of a panel containing four rows of lights, two red and two white. At a given signal the young man is required to get the white lights on a corresponding line with the red. Then immediately the red lights turn off and flash to a new position.

The Co-ordinator Test

The white lights are controlled by the "rudder bar" and control stick. The purpose of the complex-co-ordinator test is to measure the time required for the muscles of the extremities to do what the mind directs. It has been found that those having the best co-ordination make the highest grades on the automatic serial reaction machine.

The controls of an airplane — rudder pedals and stick—are employed in the final test, the automatic serial reaction machine test. This test is similar to the preceding except that three double banks of lights are used instead of two. The speed with which the would-be flying cadet responds to the continuous flickering of the lights, operated automatically as in the complex co-ordinator, is known as his reaction time.

All Results Correlated

Bringing the many examinations to an end, it remains for the flight surgeon to correlate the tabulated results and determine whether or not the applicant is eligible for the title of Flying Cadet, United States Army Air Corps. Only after he is accepted for admission does the real work of actual flight training begin.

At left, student being tested on wobbleometer for sense of balance. Contrivance at right is the complex co-ordinator which measures speed of muscle response in hundredths of a second. At top, measuring angle of convergence of the eyes.

Chest "Window" in Rabbit Gives View of Body Interior

Dr. Mendenhall observing heart and lung action of living rabbit through window in animal's chest made of X-ray film. Experiment may enable doctors to irradiate interior of body.

THE day when medical men will be able to project healing X-rays directly into the interior of the human body through "windows" serving as skin, is foreshadowed in an experiment conducted by Dr. Walter L. Mendenhall before a scientific society in Philadelphia.

The object of the experiment was a live rabbit with a window in its chest which enabled Dr. Mendenhall to observe the heart and lung action of the animal. The "window" was an oval piece of X-ray film cleansed of all emulsion. In setting the window in place on the animal's chest, the skin was first removed, and the film then grafted on in its place.

Here's a Job for Shoe Engineers

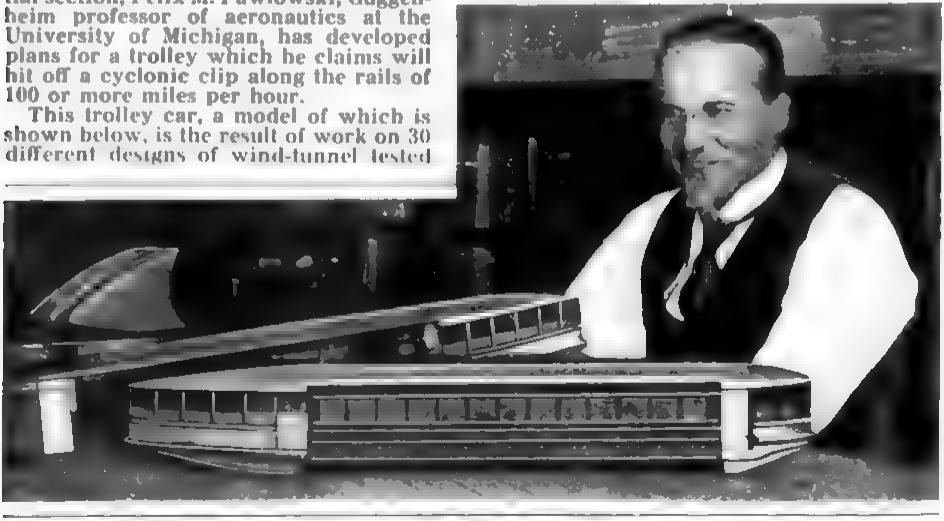
ELIMINATION of "ankle shimmy" and "foot wobble" caused by badly balanced shoes is being urged as the next step in shoe engineering. Proper distribution of the body weight over the sole of a shoe requires a side-to-side balance, as well as a front-to-back one. Most shoes now tend to tilt the weight on the foot to one side or the other, which puts severe stresses on the bones and muscles of the feet. With better design in shoes, fatigue will be reduced, along with more common foot diseases.

Streamlined Trolleys to Furnish 100 M.P.H. Interurban Transportation

WITH the growth in size and complexity of the cities, there has grown hand in hand a greater necessity for speedier transportation to outlying sections of the great urban districts.

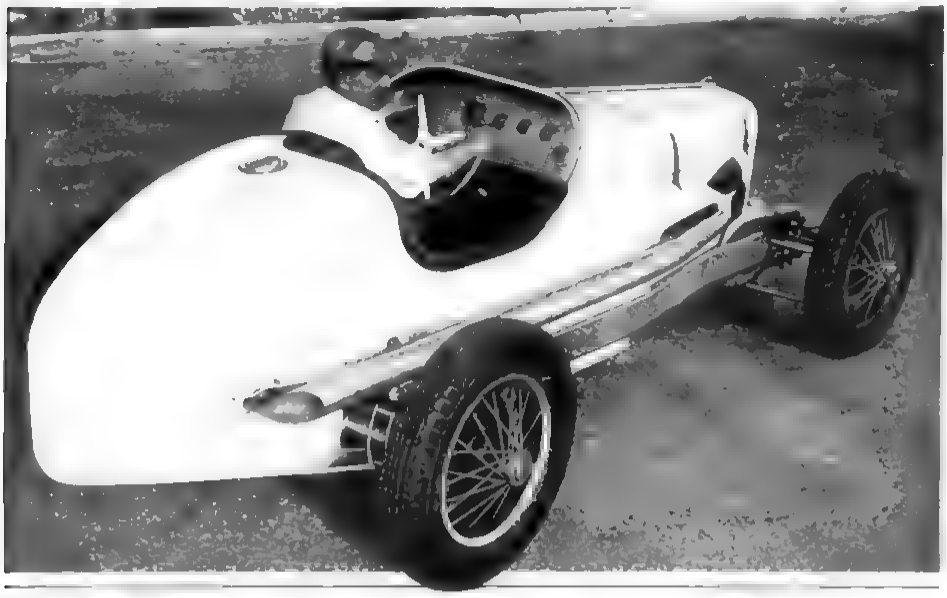
To meet the demand for high speed travel from business district to distant residential section, Felix M. Pawlowski, Guggenheim professor of aeronautics at the University of Michigan, has developed plans for a trolley which he claims will hit off a cyclonic clip along the rails of 100 or more miles per hour.

This trolley car, a model of which is shown below, is the result of work on 30 different designs of wind-tunnel tested models. What makes possible the terrific speed of the final model is the streamlining of the front, rear and undercarriage of the cars. This design reduces the operating costs at high speeds over 50 per cent. The body has blunt bow and long stern.



Streamlined trolley cars developed from this wind-tunnel-tested model may permit speed of over 100 m.p.h. in interurban districts, cutting transportation costs 50 per cent. Designer of car is Prof. Pawlowski, of University of Michigan.

Miller Builds 4-Wheel Drive Racer for 150 M.P.H. Speed



Harry A. Miller, noted race car builder, at wheel of his new 4-wheel drive machine. 300 h.p. of motor is delivered equally to all four wheels to produce speed of 150 m.p.h. Miller claims efficiency is doubled, giving quicker getaway.

WHEN racing cars gathered recently at the tracks in Indianapolis for their annual 500-mile grind, there was one car which attracted widespread attention. The attraction was the introduction of 4-wheel drive on a car designed by Harry A. Miller, who was seeking a speed of 150 miles per hour.

Miller's car is shown in the photo above, with the designer at the wheel. With the 4-wheel drive, the 300 h.p. of the motor is delivered equally to all four wheels, without any lag whatsoever. The mechanism is said by the builders to double the efficiency of the car and to provide a much better getaway, as well as much higher speed on the turns.

Miller and a staff of ten skilled mechanics occupied five months in the building of the car, which cost approximately $15,000. Miller astonished the racing world several years ago when he introduced the first front wheel drive car, a type which has since proved extremely successful.

New Gas Jet Is Needed Invention

TWO suggestions for preventing fires and explosions due to gas leaks were made before a recent conference of professional firemen in London. One suggestion is to make the gas in the mains non-inflammable by adding to it a sufficient proportion of the inert gas called carbon dioxide. This carbon dioxide then would be removed by some device attached to the gas burners so that the gas again would burn.

Here's Something New in Barrows

FANTASTIC in appearance, though extremely practical in operation, is a novel type of wheelbarrow developed by an English workingman. Instead of having a wheel on front, as all law-abiding wheelbarrows have, this new thing, shown below, has one huge drum, which practically surrounds the body of the barrow. When the operator pushes on the handles, the drum revolves, but the container section moves forward on a track within the huge wheel. Freakish as the device seems, however, it actually has advantages. For instance, it doesn't topple over easily, always keeping the right side up.

Something new in wheelbarrows is shown in photo above. Container section rolls on tracks in inner rim of the giant drum. Wheel is easy rolling and always keeps right side up.

Yes, the Climate HAS

The front of a glacier. Records of advance and retreat of glaciers indicate upward and downward trends of temperature, as indicated by melting, over periods of several years.

A series of "varves" in Montana. Each of these layers is due to one year's deposit of clay and silt in the bed of a former glacial lake. Thick layers were formed in warm years; thin layers in cool years when water carried less silt.

All of us are familiar with the old-timer who tells of winters that used to be twice as cold as those we now experience. Scientists have usually smiled at such statements, contending that climate varies over long geological epochs, but not within the life cycle of man. Yet the views held by many present-day authorities, as explained in this article, are that climate is by no means the constant factor it has been supposed to be.

TWENTY years ago when the mere man in the street remarked to the conservative scientist, "The climate has changed; the winters are not so cold or so snowy as they were when I was a boy; the rainfall has diminished since the forests were cut down" (and so forth), the learned man generally smiled a weary smile and said something equivalent in scientific language to "Applesauce!"

"It is true," he would add, "that climates have changed greatly in the course of millions of years. The geological record shows that. There was a time when the northern part of the United States was buried a mile deep under glaciers, and there was another time when semi-tropical plants flourished in the polar regions. There is no proof, however, that any perceptible change of climate has occurred anywhere on earth within historic times; much less within a single human lifetime.

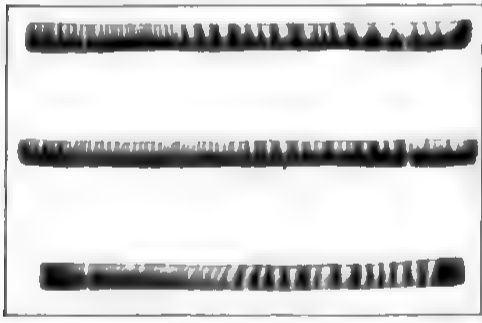
Unusual Weather Is Remembered

"The belief in rapid changes of climate is very common and also very old. A hundred years and more ago people talked of the climatic changes that they had personally observed, just as they do today. In the year 1770 a paper was read before the

CHANGED!

by CALVIN FRAZER

Boring trees to obtain cores, whose annual rings of growth indicate wet or dry seasons by their relative thickness.



At left above, cores from trees. Note rings, widely separated, indicating wet seasons; other rings, close together, point to dry years when growth was slight. At right, man is examining growth rings of redwood tree which is 1,341 years old.

American Philosophical Society entitled, 'An Attempt to Account for the Change of Climate Which Has Been Observed in the Middle Colonies of North America.' In 1781 Thomas Jefferson wrote of the marked changes supposed to have taken place in the climate of Virginia within the memory of middle-aged persons.

"All such ideas are delusions, easily explained by the fact that people remember exceptional weather and forget the ordinary weather. Thus, in the retrospect, the exceptional seems to have been the usual. You think the winters have changed since your childhood days because the occasional deep snows, that brought good sleighing, and the protracted cold spells, when ice for skating lay weeks together on ponds and streams, made a more lasting impression on your mind than did the intervening periods when snows were not deep and ice was lacking."

Scientists Change Their Minds

Such was formerly the typical scientific pronouncement on the subject of climatic changes, but today the best authorities hold a somewhat different view. They tell us that although climates are certainly not so changeable as the majority of mankind has generally assumed them to be, they are far from constant.

Just as the weather record of a single year shows many marked ups and downs of temperature, rainfall and the like, so does a record for a long series of years show

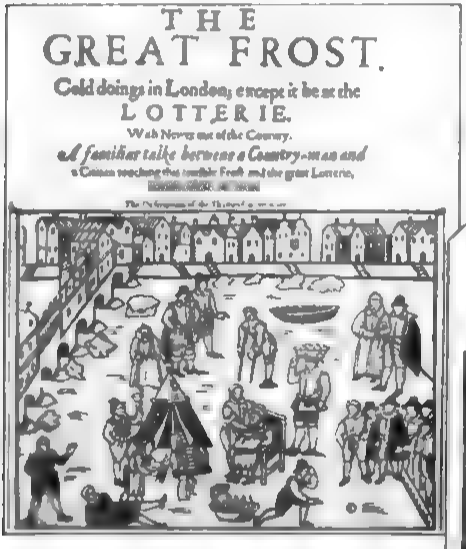
rather conspicuous swings of the yearly values on either side of the average. There is a good deal of "bunching" of warm years at certain times and cool years at others, and similarly of wet and dry years. In the eastern United States, for example, the weather, especially in winter, has been abnormally warm most of the time during the past ten years.

That such facts help to explain the belief of the "oldest inhabitant" that the climate has changed within his personal recollection is the opinion of such orthodox meteorologists as Prof. C. F. Marvin, chief of the United States Weather Bureau, and Dr. G. C. Simpson, director of the British Meteorological Office. The latter says in a recent article: "There is now little doubt that there are climatic changes of small magnitude and of a temporary nature, but sufficiently large to justify the frequently expressed opinion that the climate has changed in the course of a man's lifetime."

Weather Is Always Abnormal

Not only do the authorities admit the occurrence of these little swings of climate, perceptible to the individual human being, but they also find much evidence that more extensive and persistent climatic fluctuations have occurred within the range of recorded history, and that some of these may have been quite pronounced enough to play an important part in the economic affairs of humanity.

An official publication lately issued under Dr. Simpson's direction asserts that an abnormally warm period prevailed in northwestern Europe between 3,000 and 1,500 B. C., and that a period of abnormally cold and rainy weather set in about 850 B. C. The sixth to eighth centuries of the Christian era are said to have been drier than the average over much of the north temper-



Memento of abnormal cold period in London, January, 1608, when the Thames was completely frozen over.

A climatic mystery—weather must once have been wetter to support ruins of ancient cities found in desert regions of north Africa, as this one from Sahara.

Where a swing of climate brought disaster. Scene on Kansas plains, where a series of wet years in the 90's led to agricultural boom which collapsed when normal conditions returned. The depression in foreground was a buffalo wallow.

West front of Wasatch range in Utah, showing conspicuous shore line at base of mountains, proving existence of vast prehistoric lake in this region which once had abundant rain.

ate zone, while a period of great storminess and heavy rainfall extended from the twelfth to the fourteenth centuries. England, we are told, was exceptionally dry during the first half of the eighteenth century.

Tell-Tale Evidence of Past Weather

Evidence concerning these supposed variations of climate is obtained from a variety of sources. Instrumental measurements of weather extend back a couple of hundred years or so at a few places, and they have been made at thousands of places for the past half century and more. For earlier periods we have records of many events from which the climatic conditions can be more or less confidently inferred. Such records include the dates, year by year, when certain crops were sown and harvested in many parts of the world, and when ice formed and disappeared in rivers and harbors. There are also records of varying water levels in lakes and inland seas, and of the advance and retreat of glaciers.

Probing Ancient Weather Secrets

Much information has come to light through measurements of the annual rings of growth seen in the cross sections of old trees. The thickness of each ring is supposed to depend upon prevailing atmospheric conditions, especially rainfall, in the year when it was formed. Some of the "big trees" of California reveal the weather variations of more than 3,000 years ago, while sections of fossil trees give similar information concerning sequences of wet and dry years in remote geological times. Still other evidence is furnished by the remains of plants found at different depths in peat

Luxuriant vegetation such as this once flourished where coal is now found in Arctic and Antarctic regions, pointing to marked change of climate in course of millions of years.

bogs, pointing to alternations between wet-land and dry-land conditions.

Perhaps the most remarkable of these ancient weather records is that found in certain banks of clay, now hardened into rock, forming the beds of the temporary lakes that were fed by the melting of the glaciers of the last Ice Age during their gradual retreat to higher latitudes. The water flowing into these lakes carried sediment, which was laid down in layers consisting of a coarser portion, deposited in summer, when flow was rapid, and a finer portion, deposited in winter when there was little streamflow.

The different colors of these seasonal

(Continued on page 154)

Life Belt Has One-third Weight, 3 Times Buoyancy of Cork

New Reno life preserver, worn as demonstrated above, has only one-third the weight and 3 times buoyancy of cork.

Fingerprints Recorded on Film

A METHOD of reproducing finger prints direct from the object touched by the culprit, without the aid of photographs or other customary paraphernalia, has been devised by a French laboratory technician of the Lyons, France, police department.

The first step in the reproduction of the fingerprints is the pouring of animal black over the object on which the marks are found. Over this is then poured a mixture consisting of collodion, acetate of amyli, aceton, and ether. In a few seconds the mixture congeals into a thin film transparent as glass.

This film, a specimen of which is shown in the photo below, is then lifted off and on it is found the reproduction of the fingerprints with every detail carefully recorded. The film can be carried about and filed away like a piece of paper.

Specimen above shows how finger prints are reproduced on thin transparent film in new method developed by police.

A NEW life preserver, said to have one-third the weight and three times the buoyancy of the present cork life belts, was demonstrated recently in New York before officials to determine fitness for use on ocean liners.

The belt, shown in the accompanying photo, is worn in the customary manner, but keeps the wearer's head much farther above the water than the ordinary preserver. According to the inventor, Mr. Jesse W. Reno, of New York City, the preserver is to be used in conjunction with a balsa wood life raft which sends up identification flag as soon as it strikes the water.

Springing Shoes Exercise Feet

IDEAL for building up foot muscles are the hopping shoes, shown in photo below, which were introduced at the Fourth National Patent Exhibition held in New York. The feet are strapped to the sole pieces as illustrated. What gives the workout for the exercise is a pair of springs which are secured to the under soles.

In addition to providing exercise, the shoes also furnish a lot of fun in hopping contests, thanks to the stiffness of the springs, which give considerable impetus to the jump.

Worn as illustrated here, these springing shoes provide good exercise for muscles of the wearer's legs and feet.

Cave Men Had Scientific Ideas

SCIENTIFIC study of superstitions as relics of the science of primitive men, often quite correct and reasonable, instead of as mere instances of human credulity, is urged by an English scientist.

Without knowing the real causes of disease, primitive people nevertheless accumulated a mass of perfectly correct information about sanitary precautions. Such cave man customs as washing, the use of laurel or other plants having mild disinfectant properties, the use of salt water also now known to be a good disinfectant, the avoidance of bodies perhaps dead from an infectious disease; all are entirely reasonable precautions against germ infection.

Pulverized Coal Mixed With Air Fires Steam Generator

RADICAL departures in the method of creating an intensely hot flame for the generation of steam is represented in the construction of the furnace of a new packing plant in Rockford, Illinois. Its method of operation combines the fundamental principles of an automobile carburetor, a gas stove, and a vacuum cleaner.

Thoroughly dried and pulverized coal is fed into the "carburetor," where the fine coal particles are mixed with air in just the right proportions to support combustion. This mixture is then forced under high pressure into the boiler, burning like a gas jet and filling the entire inside with billions of burning particles of powdered coal.

The floor of the boiler operates like a huge vacuum cleaner turned upside down. The burned out particles drop down on a grate and are sucked out with pumps.

Girl is sitting on burner through which powdered coal mixed with air is shot into steam furnace of Rockford, Ill., packing plant. Ashes are sucked out through grate in bottom.

What Is Cáuse of Nightmares

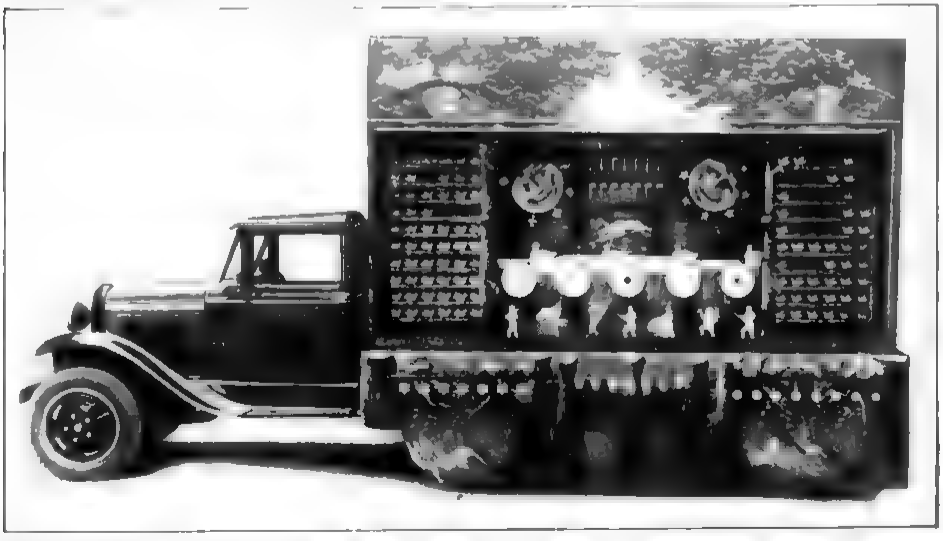
TWO theories as to the cause of nightmares were recently advanced before the Royal Society of Medicine in London. One scientist holds that they are caused by ridiculously excessive fears which beset the waking life of the victim, while another holds that the dream phenomenon has its origin in some frightful experience of the past recalled during sleep of the victim.

Motorized Shooting Gallery Brings Practice Temptations to Marksmen

SHOOTING galleries are no longer confined to parks and fairgrounds—they have sprouted wheels and are now seen cruising around in the vicinity of Coney Island.

Below is shown one of these motorized shooting galleries built by a New York inventor to patrol the streets seeking customers who want to develop marksmanship with minimum mobility.

The gallery is built on the rear end of a truck chassis as illustrated, and carries full equipment of targets to tempt the shooter's eye. The motor of the car operates the moving targets, such as rabbits, ducks, etc.



Built on truck chassis, this motorized shooting gallery has full target equipment to tempt marksmen on their home grounds.

Grow "ERMINE" Coats in

This "leopard skin" coat, selling at $750, was made entirely, except for trimmings, from white rabbit skins dyed to imitate the genuine article. Actual cost of the coat was about $60.

Note size of this White Flemish Giant rabbit beside small boy. Weighing 20 pounds, it is worth $2.50, costing $1.50

Furriers pay rabbit growers in United States over $30,000,000 a year for pelts, from which are made fur coats selling from $300 to $5,000 each. This article tells you how you set up in rabbit raising as a backyard pastime and reap the biggest profits from smallest outlay of cash.

by **H. H. DUNN**

MARY PALMER, who teaches school for $1,500 a year at San Diego, California, came out of the winter of 1930-31, with the determination to have a fur coat for the next winter.

"If I start saving now, and go in debt a little in the fall, I can get myself one of those $300 coats for a Christmas present," she told her father.

"If you will give me an hour of your time every day, from now until next October," replied her father, "I will give you a fur coat that you cannot buy for five times $300 and it will cost not more than $30, probably half that amount."

As a matter of fact, for this is a true story, Mary's father produced the fur coat on the date promised, and Mary sold it for $650 to a furrier, who, in turn, sold it for $1575. Then Mary's father gave her another just like it. The total cost of the coats to Mr. Palmer was less than $15 each, and, with their trimmings, they represented an actual outlay of not more than $35 each.

This is how the coats were produced from the back half of the city lot on which stands the Palmer home: In the spring of 1930, Mr. Palmer bought three rabbits, rather small, weighing only six or seven pounds each, with short, thick, rather light brown fur, of the density and "pile" of good plush. This particular variety of domestic rabbit is called Castor Rex, and it is bred in solid colors of brown, black, white, blue and the so-called "red" of rabbit fanciers, in reality a rather dark roan.

Mr. Palmer chose the brown variety because of the difficulty he had had in clipping and dyeing the pelts of white rabbits, which now furnish 86 varieties of fur—

Back Yard Rabbit Hutch

from "ermine" to "seal"—to the trade of this country.

This Castor Rex is adapted to all climates of the Temperate Zone, and endures the snowy winter of Wisconsin as well as it does the rainy season of southern California. The three animals cost Mr. Palmer $20 —since he bought them for their healthy condition and their fur, not for their paper pedigrees.

He built for them a three-tier hutch, such as is shown in the accompanying photograph, from free plans supplied by the College of Agriculture of the University of California, at a cost of $5.90. Two other hutches, which he built later, cost a little less.

Food for Rabbits Grown in Back Yard

On the back of the lot, an open space about 50x50 feet, Mr. Palmer planted alfalfa, chard, carrots, and a small patch of lettuce, all "crops" being rotated, and the lettuce grown not for food, but to supply the vitamin found to be necessary to rabbit mothers in the production of large litters.

By the fall of 1931, he had 97 rabbits, including the original three. Of these, 81 weighed from one and one-half to two pounds, dressed, the ideal size for marketing. Carefully kept figures showed that these had cost him 9.7 cents a pound to produce, net meat weight.

This figure, however, is too high, as 7 to 9 cents is the range allowed by rabbit-farmers who raise these animals for market. However, Mr. Palmer received 15 cents a pound for the meat, dressed. For the pelts, he could have obtained 50 to 55 cents each, or 15 to 20 cents more than the current market price for the ordinary white-rabbit pelt, which has to be clipped and dyed.

$1575 Coat Made for Less Than $35

Forty pelts were required to make each of Mary's coats. Against these pelts, he charged off $17.70 for hutches, and $11.65 for feed, a total of $29.35, or, roughly, $14.70 for each coat. The $18 which he received for the dressed meat almost paid for the original breeding stock, which he still has, as he has the hutches.

Making of the coats, with their trimmings, cost, again roughly, $20 each, bringing their total cost to the "less than $35" Mr. Palmer had promised. The furrier sold the coat which he purchased from Mary under the name of "Siberian Sea-Otter." Had it been genuine sea-otter — an animal now almost extinct — the price would have been

Here is shown the long-haired White Flemish Giant, from whose pelt eighty-six different kinds of commercial furs are made, selling up into the thousands of dollars per garment.

At right is shown "sealskin" coat, with "beaver" collar, made entirely from dyed rabbit skins and selling for $1200. This coat is made from skin of "Castor Rex," seen at the left. This rabbit has short thick fur like plush, and is most valuable.

nearer $15,000 than the $1575 he asked and obtained.

The hour-a-day which Miss Palmer gave in return for her coats went into the garden and in feeding the rabbits the vegetation produced from it, as well as the dry rolled-oats which is the staple diet of the domestic rabbit. Mr. Palmer devoted an hour a day to the same work. This was all the labor given to the fur-producers.

Meanwhile, in Chula Vista, a suburb of San Diego, E. F. Slinkard, another rabbit-farmer, was producing animals of the White Flemish strain that weigh 20 pounds at fifteen months. They dress off to 14 or 15 pounds, when ready for the oven, cost 7 to 9 cents a pound to produce, and sell for 14 to 17 cents a pound.

Rabbit Pelts Make 86 Kinds of Fur

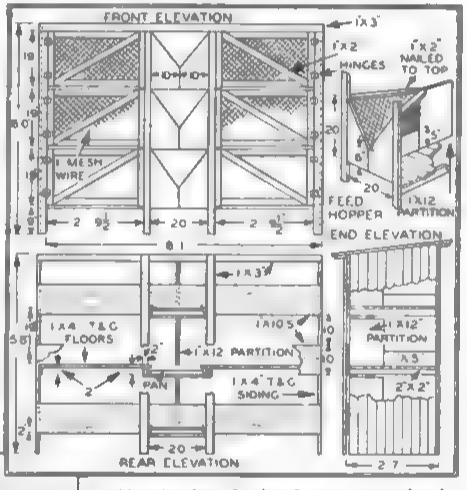
Here, then, are the two ends of an industry in which more than $5,000,000 is invested in one California county alone, and which represents an investment of approximately $70,000,000 throughout the United States. In 1930, the latest available figures showed that the industry of making men's felt hats alone took care of 100,000 rabbit skins daily.

Investigation by national and state government experts show that rabbits provide 86 different kinds of furs, from ermine to French sable. The only competitor the rabbit has as a fur-bearing animal today is the common muskrat of Louisiana, East Texas, Mississippi and other states.

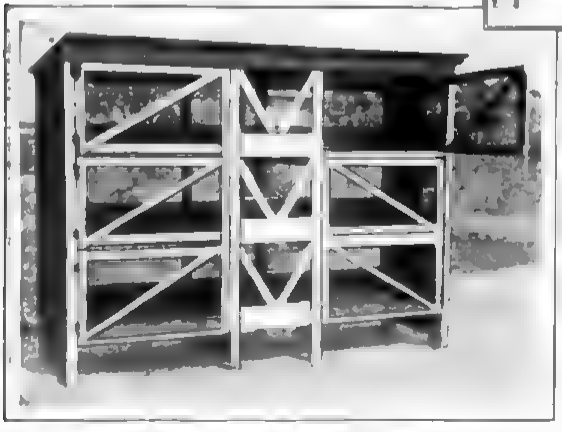
It has been found that, taking a rough average throughout the United States, 300 rabbits may be raised annually on an area 50x60 feet—the average vacant space on the rear of a city lot. Attempts to rear more than this number on such an area usually results in loss, sometimes in failure. The greatest proportionate successes have been attained by those who raise these animals primarily for their own and their families' meat supply, disposing of surplus meat to neighborhood markets, and of carefully preserved furs to established buyers.

Prices paid to the grower for meat vary from 12.5 cents, to 20 cents a pound, usually from 14 to 17 cents. Pelts bring from 35 cents a pound for the commoner and smaller varieties, of which 2.5 to 3 pelts make a pound, to 50, 60 and even 75 cents each for the rarer and more finely furred animals.

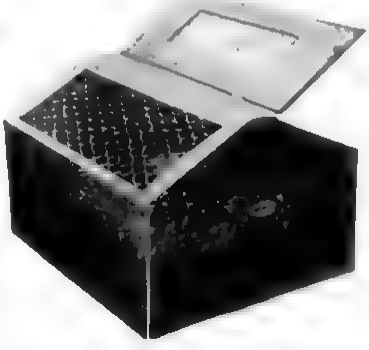
The pelts of the great majority of varieties of rabbits are used as "furs"; that is, the skin is left intact as removed, and the fur or hair clipped to the desired thickness and then the entire pelt is dyed to any color wanted. This means that the rabbit must be killed to obtain the skin. The Angora rabbit, however, is clipped, and the long hair woven into felt or into such fur as required. These animals supply an average of three "crops" of hair every two years; though in some favorable climates, two a year may be cut. The Angora, how-



Working drawing of 3-tier, 6-compartment hutch.



Here is a sample of the type of 3-tier hutches developed and recommended by the College of Agriculture of California University, which has made extensive experiments in raising rabbits for meat and fur.



For carrying and shipping of rabbits, this type of carrier proves most satisfactory, admitting plenty of light and air.

ever, is not so profitable as a meat rabbit, and is more difficult to rear.

The common combination rabbit, which furnishes "ermine" from its pelt, and 8 to 12 pounds of marketable meat, is the white Flemish giant, in which strain has been developed the new 20-pound animal. The New Zealand red is another large animal, primarily raised for meat, but supplying a fur which, while it has to be dyed, is heavy and suitable for the manufacture of such fur garments as American seal, Arctic seal, Baltic black and brown fox, castorette, chinchilla, and more than a score of others.

U. S. Fur Trade Uses 125,000,000 Pelts a Year

For such fur garments, consisting of 40 to 80 rabbit skins each, the retail price ranges from $300 to $5,000. In England alone, this business of growing rabbits at home has increased from a production of about 150,000 pelts in 1929 to an estimated output of 1,500,000 skins in 1932. British rabbit-breeders estimate that at least 85 per cent of these rabbits are raised on back-yard areas covering not more than 200 square feet—a strip, say 20 feet long by 10 feet wide.

There are more than 200,000 rabbit-growers in the United States, and this does not include probably one-fourth as many more who merely keep a few rabbits to cut down their meat costs. The fur trade in the United States alone consumes more than 125,000,000 rabbit skins a year, approximately half of which is made into fur garments and fur trimmings for women.

Furriers pay rabbit-growers of the United States nearly $30,000,000 a year for pelts, and slightly less than $25,000,000 annually to foreign producers. Rabbit-growers estimate that $5 a year net profit from each breeding doe, who will produce about 20 young animals annually, is a fair average, especially in the larger plants, where several hundred such does are maintained. Back-yard rabbit-growers sometimes reach $10 to $12 a year profit from a single female.

Original costs of these breeding does, about one year old, is $5 at the present time, though a year ago it was $7.50, with $10 as a top price, except for fancy stock, such as the Castor Rex, mentioned at the beginning of this story; the Himalaya, and some of the small blues and reds. It probably is best for the home raiser of rabbits to avoid these fancy breeds and devote his attention to the well-established Flemish and New Zealand strains, which are hardier, more adaptable in their feeding habits, and which give greater weight at an earlier marketing age.

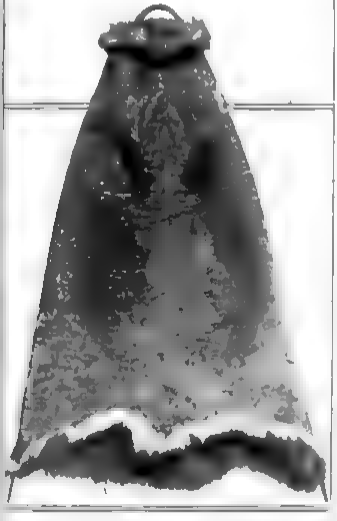
What Rabbits Like for Food

The hutches and carrying cases which have been found most successful are pictured herewith in such manner that they need no description. It has been found that a maximum of two ounces of feed daily for each pound of weight of the animal gives the best results. This feed consists mainly of alfalfa, well dried, and coarse, dry, rolled oats, such as is fed to other livestock.

Carrots, green alfalfa, lettuce, green bar-

(Continued on page 152)

Only two white rabbit skins were required to make this little girl a coat and hat, at a total cost of 70 cents.



In stretching and drying skins, place them over wire frame as illustrated here so that there will be no danger from wrinkling. Keep all pelts out of reach of cats, who thrive on the hide. Salt makes fine preservative.

Made from 40 rabbit skins at a cost of less than $35, this "sea otter" coat sold for $1,575. Over 4000% profit.

Fortune Making IDEAS

Immense consumption of oranges in this country has created a demand for a simple orange peeler that will relieve housewives of the distasteful peeling job.

Shoe repair bill will be cut materially by inter-changeable rubber heels.

Our present method of putting in a window pane with putty is hopelessly antiquated. What is needed is a metal strip that will hold the glass firmly in place and seal it effectively against weather. With such a method, anybody can do job of setting new glass in place, making carpenter unnecessary.

What to invent? That's the question most frequently asked by mechanics of an inventive turn of mind. It's the purpose of this department to answer that question for you. This month Mr. Yates offers suggestions for a number of much-needed inventions that, while extremely simple, will probably net young fortunes for inventors who exploit their product properly.

1. Cheap Orange Peeler

ORANGES are being consumed at a very rapid rate today—almost as fast as apples. Practically every housewife nowadays is faced with the necessity of peeling a half dozen oranges for one of the daily meals.

This is a distasteful job, too, and most women heartily despise it. But where have our inventors been, hiding some place? Somebody is asleep at the switch. Give me a decent, cheap orange peeling machine that is manually operated and I will sell it for a hundred thousand dollars so quick that you'd be surprised. That would be easy.

We don't want an elaborate power-driven machine but just a simple little device that needs to be turned by a handle and that will peel the orange in a new way, not in a long string like potatoes are peeled. Rather the peeling should be done in sectors so that an orange may be half peeled for purely decorative purposes.

Specifications: Should sell for a dollar or under and should be able to peel a dozen oranges in three minutes or better. Should be made of stamped or pressed metal and should not have any delicate adjustments that are beyond the housewife.

Exploitation: Should be patented in this country only and should be sold on a royalty basis with a down payment of $5,000.

2. Inter-Changeable Rubber Heels

Who has not had the experience of having two new rubber heels put on their shoes merely to replace two perfectly good heels that were simply run down a little on each side? Why not have heels that are inter-changeable so that when they are reversed the worn parts will change places

for INVENTORS

by Raymond F. Yates

For Inventors Wanting Advice

Mr. Raymond F. Yates, who conducts this department for inventors, is an eminent authority in his field and always stands ready to give Modern Mechanix and Inventions readers advice on patent, law, and marketing procedure. When requesting advice, however, do not send models of your invention, as they will not be accepted. All that is necessary is a complete drawing and clear constructional data. Stamped, self-addressed envelope must be enclosed. Address Mr. Yates in care of Modern Mechanix and Inventions, 529 So. 7th St., Minneapolis, Minn.

with the unworn parts? Such a system would permit the user of rubber heels to have just about double the wear from each set that he bought.

The invention here lies in some quick and secure method of fastening the heels to the shoes. It must be positive, fast and done by anyone.

Specifications: This can be no freak or impractical method. It must be tried under actual wearing conditions and the method of holding should, unlike the rubber heel, suffer no deterioration. Nothing should be added to the cost of placing heels on shoes, the invention involving a new kind of fastener to replace the nails now used.

Exploitation: Should be patented in all countries and the method should be sold on a royalty basis.

3. *New Method of Installing Windows*

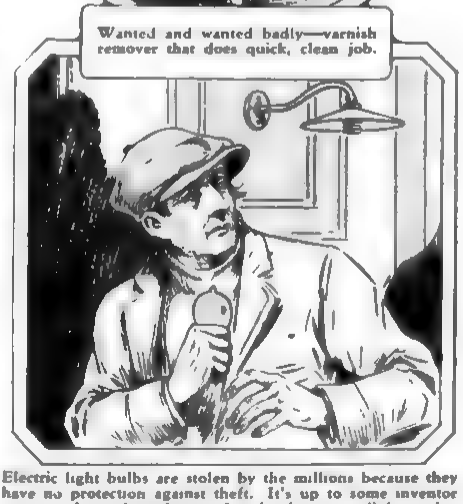
Did you ever stop to think of the time that is spent putting in new window panes by the old-fashioned method that we now employ? Can we find a better way of putting window panes in so that the operation will be as simple as screwing in an electric light bulb?

The puttying method now used is a most unsatisfactory solution of the problem for it ages, cracks and finally breaks off. Why not some sort of a metal strip with rubber seal that could be installed by any person and that would outlast the method that we now use? Does not sound impossible does it? Well, let's have it. It will be worth a wheel-barrow full of money.

Specifications: Method should be simple and inexpensive, at the same time sealing the window just as effectively as does putty and should also last longer. It should not cost more than twenty cents to install a pane of glass twelve by twelve inches. That is exclusive of the glass.

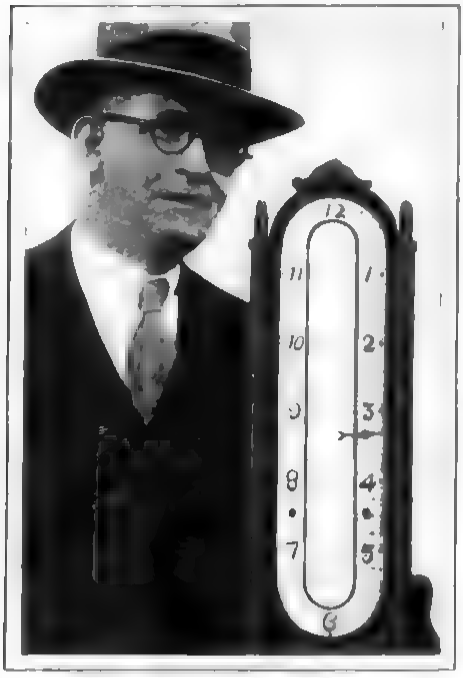
(Continued on page 160)

Automatic waffle irons are too expensive. Inventors will make a sizeable fortune by developing an iron that will do its tricks for about one-half present costs.



Electric light bulbs are stolen by the millions because they have no protection against theft. It's up to some inventor to stop these depredations by developing a light socket that will make theft of a bulb impossible. The contrivance would be grabbed up quickly by fixture manufacturers.

Single-Handed Clock Keeps Time With Utmost Accuracy



A. S. Snively with single-handed clock of his own invention. Indicator travels around oblong dial once every 12 hours, keeping most accurate time due to simplicity of mechanism.

WHETHER it will ever supplant the old two-handed clock or not is impossible to predict, but at least the one-handed clock perfected by A. S. Snively, a Norwalk, Ohio, inventor, is attracting wide attention by its uniqueness.

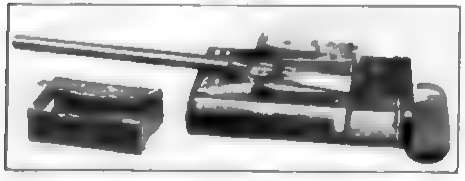
Shown in the photo at the left, along with its inventor, the clock has an oblong shape, with a hand which moves along a track near the edge, making one complete revolution every twelve hours.

The size of the dial permits hours as well as minutes to be clearly designated. The clock is declared to keep unusually accurate time due to extreme simplicity of the mechanism and the accuracy of the gear work. Hours are indicated in the usual manner, but the minutes are represented by divisions between the individual hour marks.

Door Alarm From Trick Match Box

SOME rather elaborate devices are made to alarm one on the opening of a door or window, but this little affair rigged up from the "interior" of a common ten-cent trick match box is a home-made substitute with a few merits of its own.

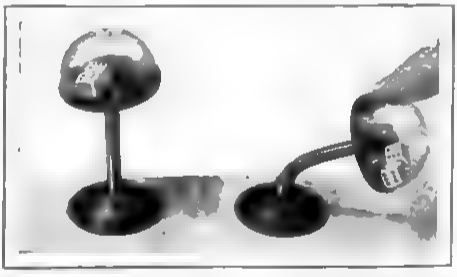
The mechanism is simply fastened with a rubber band to an empty tobacco can, the lid of which is left open. A flatly whittled pencil or tapered stick is lightly stuck under one end of the frame, the end of the pencil being placed close to the door. When forced in the least bit through contact with the swinging door, the raising of the mechanism by the pencil end starts the hammer off with a tattoo that would awaken Rip Van Winkle. When not in use the machinery can be kept in can.



When door strikes pencil, the mechanism from trick match box beats a terrific tattoo on the tobacco can to sound alarm.

Automatic Shaker for Dice Games

THERE can be absolutely no crooked work with a new automatic dice shaker now on the market. Resembling a toad stool, as can be seen in the photo below, the shaker has a glass dome which gives a distinct view of the dice. The shake-up is accomplished by pulling the top to one side and letting fly. The dice then get a good rattling, thanks to the spring which serves as an upright. There need be no fear of the device losing its anchorage, since a vacuum cup base holds it firmly to the table.



Pulling back top with finger and letting fly, gives the dice a thorough shaking up. The upright is made of coil spring.

Poison Fog Breaks Out in France

ANOTHER poison gas case in an industrial city, not unlike the "death fog" in Belgium last year, is reported in the French city of Lyons. That city is a center of the silk industry, which uses large amounts of tin compounds to impregnate silk fibers.

Recently a leak developed in one of the factories using this material and a quantity of the gaseous tin compound called stannic chloride got out into the air. This compound was one of those used during the war in hand grenades to produce a stinging, choking fog. The same kind of fog was produced in nearby parts of Lyons, so that citizens suddenly felt their eyes smarting and their throats choked.

PLANE TALK

Edited by DOUGLAS ROLFE

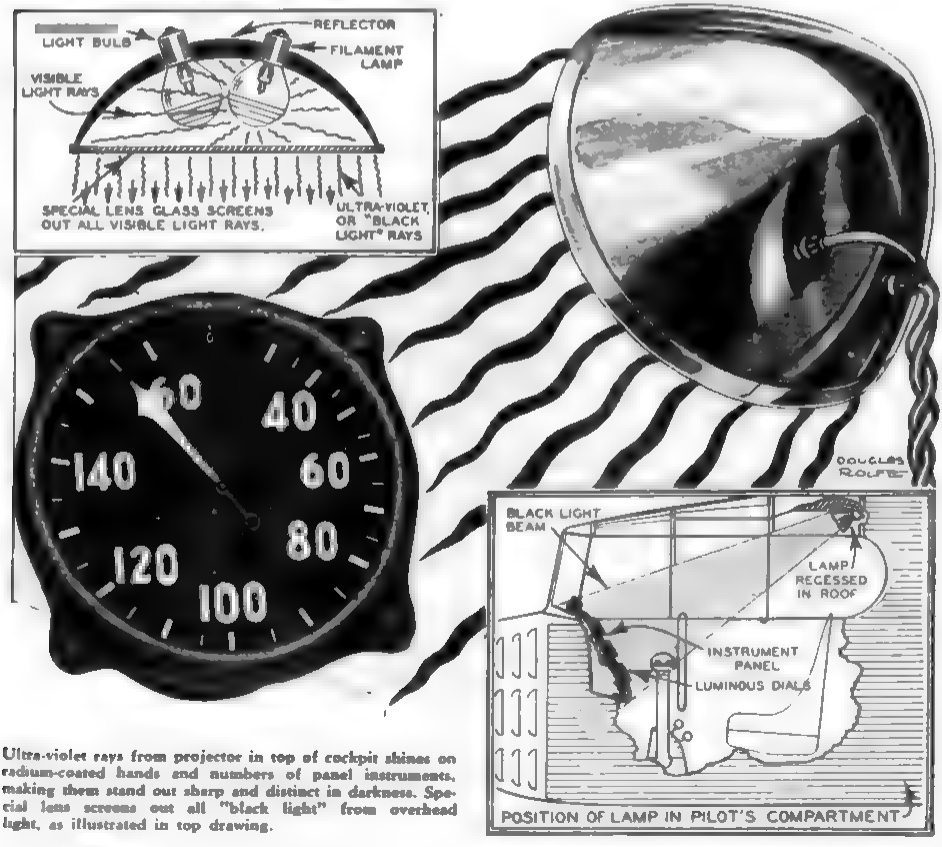
Flying by Instrument Safer with Black Light

TODAY transport pilots are placing more and more responsibility upon the performance of their instruments for successful navigation. To be able to read meters, indicators, and compasses quickly is thus of great importance to the safety and ease of night flying.

To overcome the difficulty arising when stray light shines out from the dashboard and into the eyes of the pilot, thus interfering with his vision, aeronautical engineers are now employing "black light," or ultra-violet rays.

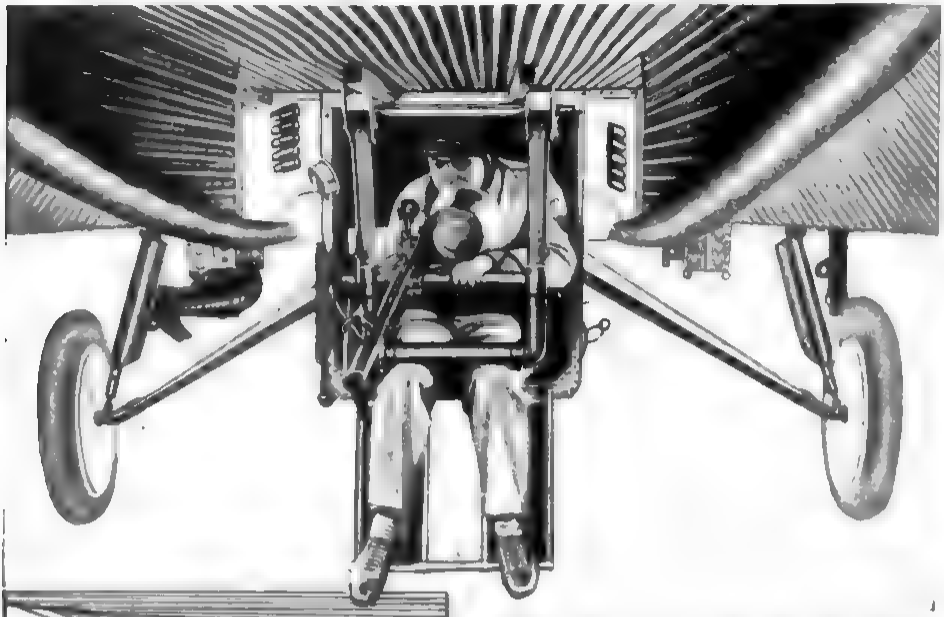
The principle of this new lighting scheme is based upon the fluorescent quality of radium paint and the characteristic of ultra-violet rays to make this paint glow with greater brilliancy. In the method devised, a light like an ordinary auto headlamp is installed in the cockpit in the position illustrated below. Over this lamp is fitted a special lens which screens out all colors but the ultra-violet rays, which are projected down against the instrument panel.

Pointers and numbers on the instruments are coated with radium paint and glow with sharp distinct outlines in the darkness when the ultra-violet rays fall on them. In addition, this method of lighting eliminates necessity for lighting of any kind in the cockpit, so that the pilot has perfect visibility at all times.

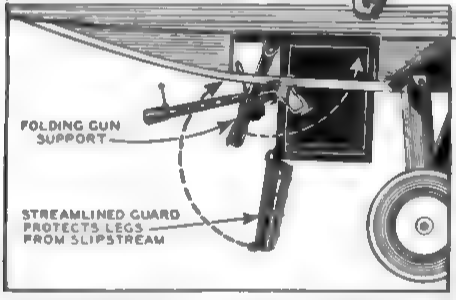


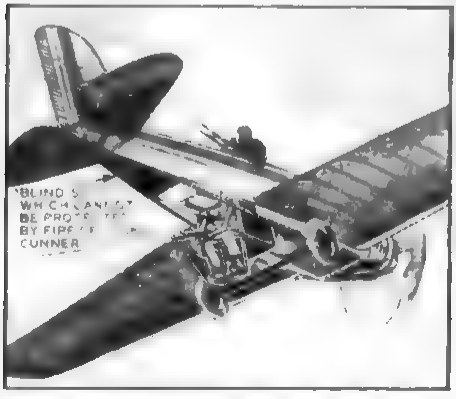
Ultra-violet rays from projector in top of cockpit shines on radium-coated hands and numbers of panel instruments, making them stand out sharp and distinct in darkness. Special lens screens out all "black light" from overhead light, as illustrated in top drawing.

Machine GUNNER SITS



This is a photo of the new machine gun perch underneath the fuselage of a plane which appears on this month's cover of the magazine. It folds up when not in use.





Upper drawing shows how machine gun perch folds up when not in use; lower drawing illustrates need for a machine gun beneath plane to protect blind spot in tail.

PILOTS of combat planes in the World war were acutely conscious of the fact that their ships had a "blind spot" in which they were peculiarly vulnerable to attack by the enemy. This spot included the underpart of the tail and rear section of the fuselage, which could not be defended by machine gun fire from the cockpit for the reason that the gunner would have to fire through his own plane.

Combat Technique Will Be Changed

Around this fact was built most of the strategy of aerial maneuvering, the object of the attacking plane being to come up beneath the enemy ship in the blind spot where a raking machine gun fire could be delivered without danger of return fire from the other ship.

Obviously the plane being attacked made every effort to avoid being jockeyed into this dangerous position, bringing into play every trick of piloting—and the best man usually won, with death for the loser.

It has remained for Flygindustri, a large Swedish manufacturer of airplanes, to develop a beneath-the-fuselage machine gun perch which does away with the blind spot entirely, and which may very well revolutionize prevailing methods of aerial combat technique.

SUSPENDED *Under Plane*

The photograph at the top of this page shows the perch with a gunner in position to attack an oncoming plane. The gunner faces the tail of his own ship, sitting in a trapeze-like box with a machine gun swinging on a special support in front of him. He can move the gun up or down and to right or left so that the old blind spot area is effectively covered.

Streamlining Reduces Resistance

Streamlined leg guards protect the gunner from the air stream, the guards also serving as foot rests. In an emergency the gunner can make a parachute jump to safety by swinging the machine gun up and out of the way.

As yet the device has not progressed beyond the experimental stage, but it has been adequately tested by its designers and found to serve its purpose marvelously well. There is a slight lessening of speed because of the frontal resistance of the perch, but the advantage of being protected against attack from all angles far outweighs this objection.

Can Leave Perch Via Parachute

A trap-door can be provided through which the gunner can descend to his perch from an upper cockpit, although in the experimental models the gunner has sat in his perch from the moment of take-off until landing, except as he may decide to descend via parachute instead of with the plane.

Heavy bumpers running along both sides of the fuselage protect the perch from damage in case the plane makes a rough landing. Leg guards fold up and the gunner sits tight until the ship rolls to a stop. It's not very comfortable, but that's of no importance to military necessity.

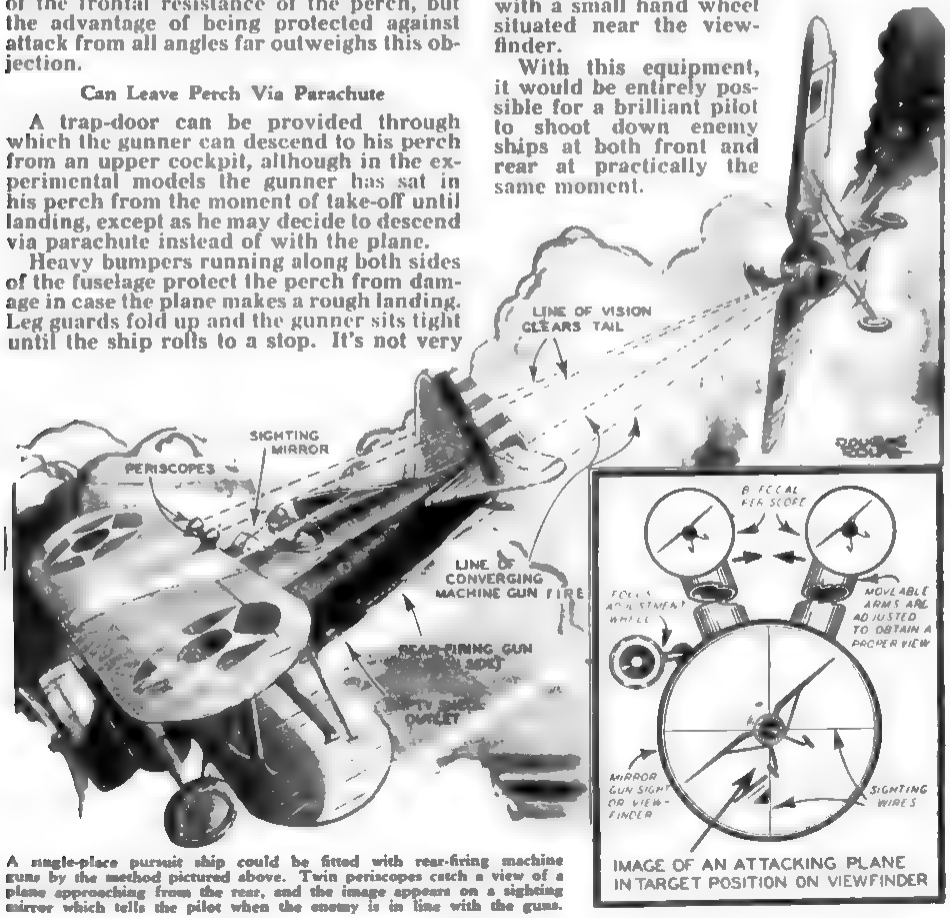
Single-place pursuit ships can likewise be provided with a machine gun defense for their blind spots by an entirely different adaptation of the rear-firing gun idea, illustrated below.

In this instance, two guns would be mounted on the lower sides of the fuselage, one on each side immediately below the pilot's cockpit, where they would be handy for clearing jams. Placed here, they would be able to direct a converging line of fire on an attacking ship.

Periscopic Gun Sights

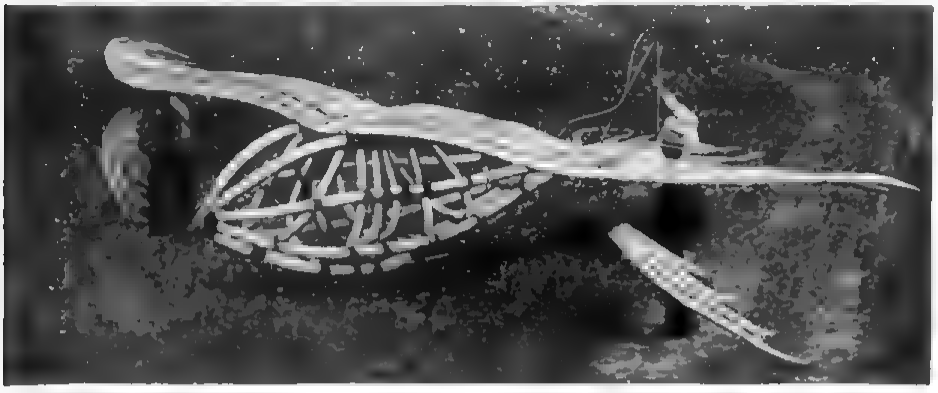
To obtain effective aim it would be necessary to have a periscopic gun sight installed, along the lines of the mirror-sight shown in the drawing. The periscopes would be hinged to get focus and this would be controlled by the pilot with a small hand wheel situated near the viewfinder.

With this equipment, it would be entirely possible for a brilliant pilot to shoot down enemy ships at both front and rear at practically the same moment.



A single-place pursuit ship could be fitted with rear-firing machine guns by the method pictured above. Twin periscopes catch a view of a plane approaching from the rear, and the image appears on a sighting mirror which tells the pilot when the enemy is in line with the guns.

Glider Has a Rubber Tube Frame Fashioned After Birds



"Pneumatic glider," shown here, has framework of rubber tubes which are pumped up to rubber tire hardness. Claw-like flappers beneath the wing will be used in effort to maintain flight by man-power after the plane has been launched.

SEEKING the last word in lightness combined with strength, an aeronautical engineer of Washington, D. C., has succeeded in constructing a framework for a glider made entirely of rubber tubes.

The "pneumatic glider," as the craft has been dubbed, is patterned after the physical shape of a gannet, a fishing bird renowned for its flying ability. In the photo above note the pair of claw-like flappers hanging beneath the wings. These appendages will be used to maintain flight by man-power after the plane has been launched into the air.

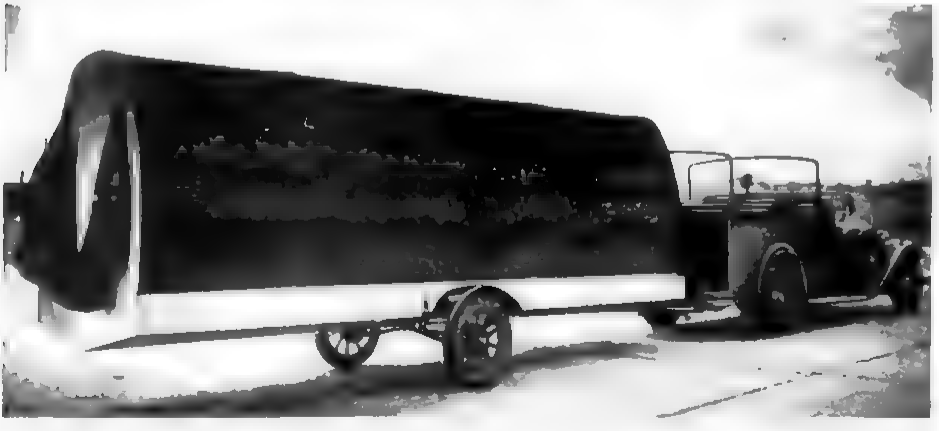
The pilot will sit in the fuselage surrounded by a maze of rubber tubes that form the body. When these tubes are pumped up to auto tire hardness, the glider is expected to have unusual sturdiness. The rubber-tube framework has been completed.

Trailer and Glider Hangar in One

THE problem of transporting a glider to the flying grounds and at the same time providing the craft with a protective housing at any place it may rest, is permanently solved by the combination trailer and hangar which recently made its appearance in Germany.

The trailer, shown below, rides on only two pairs of wheels, and is covered with a canopy of canvas that may be pulled back to remove the glider. When towed to the air field, the trailer disgorges the glider, which is assembled on the spot for flights. At the end of the day, the glider is disassembled and stowed away so that it can be hauled back to the home grounds.

With a well-balanced trailer, any auto is found adequate for the towing job.



With this combination trailer-hangar, the glider can be hau'ed to flying field for flights, then disassembled and stowed away again in trailer for transportation back home. German glider fans are responsible for the innovation in hangars.

New Rotor Boosts Plane, Boat Efficiency

Drawing at top is artist's conception of Volf Rotor Impellers as applied to an air liner. Photo shows model of rotor, which has three conical fins on shaft to feed water to blades.

Artist's drawing here illustrates use of Volf rotors on pneumatic rocket boat. The longitudinal fins draw water for the blades at all speeds. Set at a 30-degree angle, blades provide a greater working surface than conventional propellers.

THE commercial application of a type of rotor which operates on novel principles promises to unleash new speed and economy records in the aviation and boating world.

The new rotor, shown in model form in the photo above, is in reality a variation of the flat plate screw, having the advantage that the energy increases with the speed, which has no maximum. It cannot overspin to the point where traction is lost.

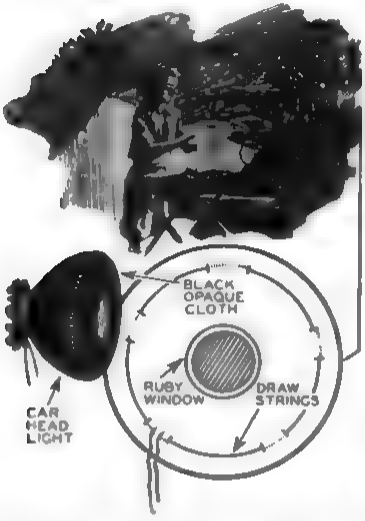
Use of the rotor in large vessels or aircraft required a metal strong enough to withstand terrific strain on the angular blades, yet light enough to be practical. Following intensive research, polychrome steel was utilized.

The rotor, with but one change in design, has been found adaptable for marine propellers, vacuum cleaners, air driven boats, airships and planes. Probably the most widespread use will be in marine craft, large and small. Diesel powered vessels will find great economies in the rotor, upwards of three times the efficiency being claimed for it over the conventional propeller design.

The marine rotor is six-bladed, with three conical fins attached from rim to shaft, as shown in the photo above. The fins feed the rotors, drawing water for the blades at all speeds. The blades are set at a 30 degree angle and provide a greater working surface than conventional propellers.

HANDIKINKS

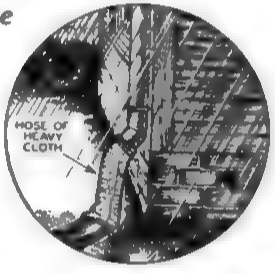
Handikinks department is the place to find simple, labor-saving stunts that will be of immense benefit to you around the garage, the workbench, or in the home; in fact, any place where there is work of any kind to be done.



Using Car Head Light to Develop Films

CAMERA fans who like to develop their films or plates while out on a camping trip can easily convert the head light of the car into a darkroom light and dispense with the darkroom. To accomplish the former task procure a circular piece of black opaque cloth about two feet in diameter and a disc of ruby colored celluloid about 4 in. across. Hem the cloth around the edge and cut a circular hole in the center 3 in. in diameter. Lay the ruby disc over the hole and stitch it firmly to the cloth, then sew bias tape over the joint to exclude all light. Apply drawstrings as shown in the drawing. When filling plate holders or developing negatives, cover the one light with a blanket and the other with the above mentioned contrivance.—L. B. Robbins.

Stop Rainspout Gurgle

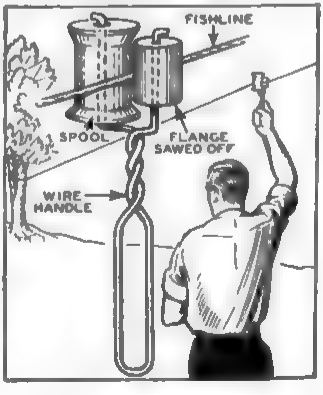


ON a day or night when the rain is falling heavily, the splash and gurgle of water from the downspout sometimes makes entirely too much noise, producing an irritating effect on the nerves. Silencing the racket is easy, however. Simply procure a piece of burlap long enough to reach the ground from the spout and wide enough to form a hose. Secure one end of this burlap hose to the spout, as illustrated in the accompanying photo.—Hi Sibley, Jr.

Easily Built Lazy Back Seat for Bed on Beach

SITTING up in bed to read, propped up by pillows, becomes extremely tiresome after a while, but this lazy back seat makes the semi-reclining position very comfortable. In addition, it is also very handy for the beach or at picnics. Construction is as simple as could be wanted. The sides of the folding framework are ¾ in. by 1 ½ in. maple or other hardwood, fastened together with ¾ in. dowels, as illustrated. A strip of awning cloth forms the back and seat.—M. Watson.

Save Fish Line by Drying It With Wringer

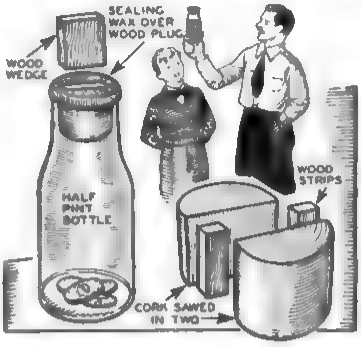


THE careful fisherman will always dry his line before laying it aside or storing it in a tackle box. The natural drying process requires too much time, so here's a device to hasten the job. A stout steel wire is bent into the shape of a fork having two tines, over which are slipped spools as illustrated in the accompanying drawing. They are held in place by bending over the ends of the prongs. In operation, the spools are spread to receive the line, which should be stretched to full length and suspended between two trees. The device is then drawn from one end of the line to the other so that it will remove the water by its rolling pressure. This job completed, the line will dry rapidly.—G. E. Hendrickson.

Stunts to Edify and Amuse

Watch Deposits Grow in Milk Bottle Bank

MOST thrift banks for youngsters conceal from the savers the coins that have been deposited, but this one shows at a glance the accumulated wealth. A milk bottle forms the container. As to the slot, it may be made from a cork, sawed in two as illustrated, with a couple of thin strips of wood set between them to form a slot large enough to take a half dollar. This arrangement is then inserted in the mouth of the bottle, and sealing wax poured over it to make it tamper-proof. First, however, insert the wood wedge in the slot, so that the top will hold shape while sealing is being done. —Mason Canner.

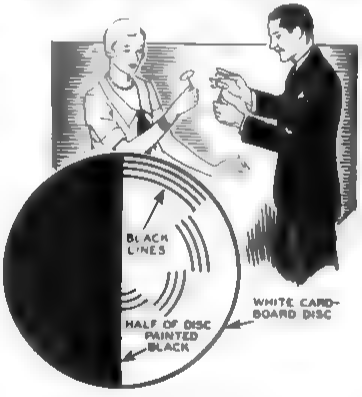


Gas Makes Artificial Butterflies Take Wing

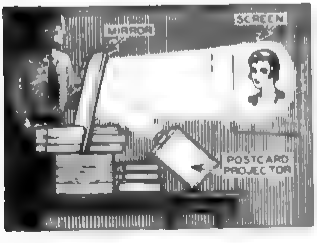
HERE'S an attractive little experiment that will interest both chemistry and aviation fans. Get an empty fruit jar with a metal screw top and in the cover make a hole which will accommodate a funnel as shown in the drawing at left. Now on tissue paper draw out shapes of butterflies and where the body would be glue thin strips of cork. Half fill the jar with water, then, into it put the contents of a package of Sedlitz powder. Quickly replace the cover with the funnel and then into the latter put the paper butterflies. The gas rising through the funnel will start the butterflies flying. If there are any cracks where funnel passes through cover, fill these with candle wax so gas can only escape through funnel.—L. Bastin.

Black and White Disc Changes Color

OUR eyes are probably the most deceptive organs in our body, thanks to their slow sense reactions and some of the strange laws of optics. This little experiment will illustrate what is meant. The stunt makes use of a cardboard disc about 2 in. in diameter with a pin hole in the center to form the axis of rotation. Paint one-half of this disc a flat black, and on the white half inscribe a series of arcs as illustrated in the accompanying drawing. Now mount this disc on a pin set in a small stick and take the device to a strong light. Spin it slowly and you will observe that the black lines take on various colors, mainly red. Show the disc to your friends and all of them will likely report that they see other and different colors. Why does this happen? It makes an interesting problem to look up in a textbook on the science of optics.—W. E. Truitt.

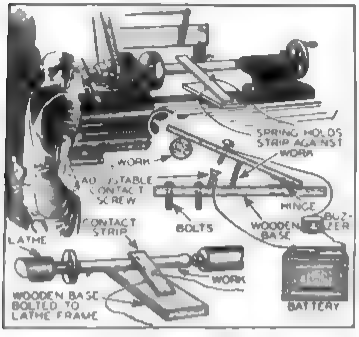


Mirror With Card Projector Sets Reversed Lettering Right on Screen



MODERN MECHANIX AND INVENTIONS readers with post card projectors will be interested in this little scheme to reverse the reversed writing on pictures shown on the screen. On a box mount a large mirror, as illustrated in the accompanying drawing, and direct the light beam against it. This mirror will reflect the beam against the screen and at the same time show the writing on the card in the normal position. The camera is set on the table tilted up at about 70 degrees or so. If the picture will not clear up by moving the lens, then the mirror will have to be moved. A little experimentation will be necessary but this will only make the job more interesting to camera fans.—Warren Mundis.

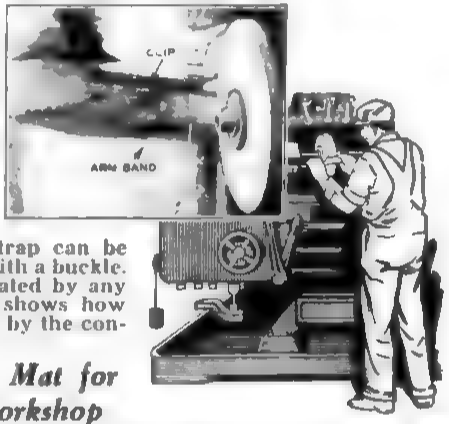
Labor-saving Workshop Kinks



Automatic Lathe Calipers Ring Buzzer

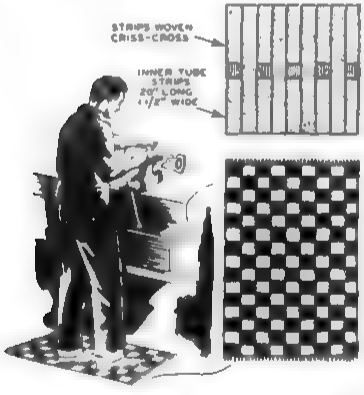
HERE'S a scheme that will not only measure your lathe work accurately but will also save a great deal of time and labor. A small strip of wood is hinged to a larger supporting base which is held securely to the lathe underneath the material worked upon, as shown. The two pieces of wood are fitted with contacts in the form of screws, which may be adjusted for the work. A spring between the two blocks holds the upper strip tightly on the work and when the proper amount is removed from the turned wood the contacts on the blocks meet and ring a buzzer, telling the worker when he has cut enough. A bell or light or similar device may be used in place of the buzzer. Of course, a battery must be used in series with the buzzer, bell or light, as shown in the diagram.—Leonard Mitchell.

Arm Holder Keeps Scale Handy



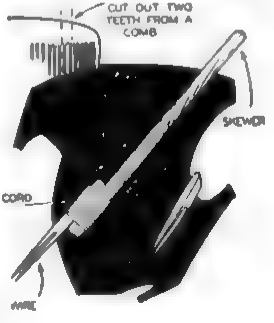
WHEN grinding batches of work to length it is handy to have the scale in a position where it will not have to be picked up every time a piece has to be measured. If a short scale is used an ideal way is to use an attachment like the one shown in the photo which leaves both hands free, yet holds the scale in the handiest of positions. This holder is made from a piece of sheet metal bent as shown to grip the scale. A slot is cut in each edge so that a leather strap can be slipped through to hold the piece on the arm with a buckle. The handiness of this device will be appreciated by any who once use it. The accompanying photo shows how work is measured on the scale while it is held by the contrivance.—W. H. Moore.

Rubber Mat for the Workshop



A VERY neat and serviceable porch mat, ideal for your workshop, may be made from discarded inner tubes. It is formed from rubber strips cut from inner tubes of the dimensions given in the accompanying drawing. In shaping up the mat, lay one strip on the workbench and another across it in T formation. Lay the next strips under and alternate until the strip is covered. This will give you a strip running over and under the center cross strip. With a brush cement the strips together where they lap, using a good grade of cold patch or air cure cement. When these strips are all covered and arranged in order, cover with piece of wood and heavy weights. Allow five hours for the cement to dry.—H. B. Shumway.

Skewer From Comb Teeth Picks Up Bolts, Nuts

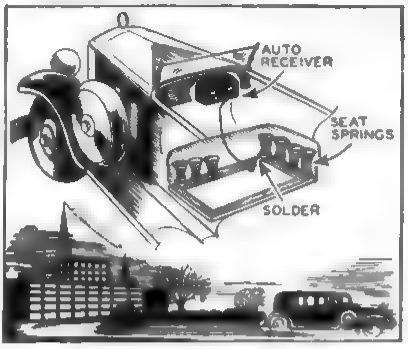


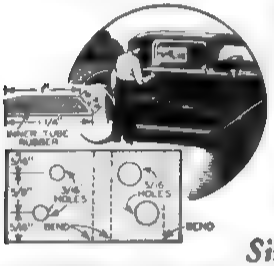
NEED a skewer to pick up screws, bolts, etc., that have fallen down into some inaccessible place? If you can lay hands on an old comb you can easily make one, as illustrated in the accompanying drawing. Cut off a section holding two of the teeth, as illustrated, and bind them to a handle with small wire. A small wire should also be bound around the middle of the teeth so that a better grip can be had on the object. The longer the teeth, the better they will be for the job.—Ralph Madison.

Simple Wrinkles for Auto Upkeep

Auto Seat Springs Make Radio Antenna

IN THE ordinary auto the manufacturer has installed an antenna for the motor radio without knowing it. This antenna is nothing more than the springs under the front seat. To utilize them as an antenna, solder a wire to the metal and run the lead to the antenna post on your auto radio. This lead is easily placed under the foot pad thus making it invisible. In case your front seat rests upon metal you will have difficulty in employing this antenna. Insulators will have to be inserted under the springs to prevent a ground. Such an antenna provides almost as high efficiency as the built-in antennae with which many high priced cars are now equipped. Ordinary lamp cord will suffice for lead-in wire. —Reginald R. Williams.



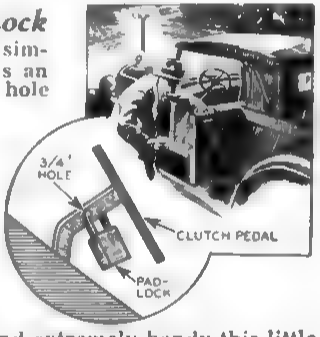


Metal and Rubber Pad Prevents Door Vibration

DO THE doors on your car vibrate? If so insert this little gadget in the lock. It is made of either heavy tin or galvanized iron, about 20 ga. for easy bending. Use 6¾ in. wood screws with small washers to secure it in position, placing the tapered part towards the door. The gadget will allow the door to slide into place easily and prevent it from sticking. The metal around the rubber keeps the door from wearing out the cushion. The purpose of the device is chiefly, however, to soften the blow when the door is closed.—W. W. Erickson.

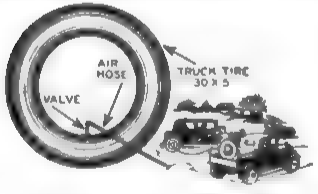
Simplest Thief-proof Car Lock

HERE'S a thief proof car lock that is the last word in simplicity, as well as efficiency. The only part utilized is an inexpensive padlock. To work out the scheme, drill a hole through the clutch pedal directly above the floor boards and insert a good padlock, as illustrated in the drawing at the right. The awkward position of the lock on the floorboard makes it extremely difficult for auto thieves to break. With such an arrangement thieves will find it impossible to drive the car even though the motor can be started, because the lock prevents the clutch from being thrown in. The lock will be found ideal for roadsters or open cars.—Edward Sievers.



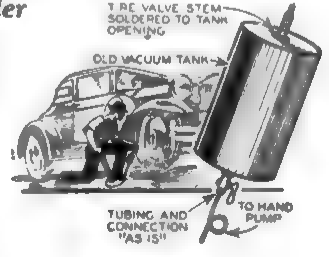
Old Truck Tire Serves as Compressed Air Tank

AUTO service men will find extremely handy this little stunt of transporting air under pressure to the scene of the job. An old truck tire, about size 30x5, is mounted on the rear of the service truck, as illustrated in the drawing. Then an old valve stem is soldered to the valve of the tire (after removing valve innards, from part of valve soldered on), and an air hose attached. The tire is then inflated to 150 lbs. pressure. It can then be driven out to a tire repair job.—John W. Sellner.

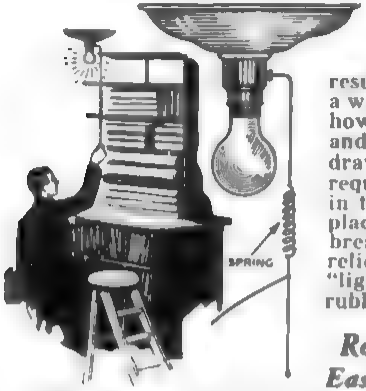


Old Vacuum Tank Makes Efficient Spring Oiler

A HIGHLY efficient automobile spring oiler may easily be constructed from a discarded automobile vacuum tank and a tire valve stem, containing the valve core, as shown in the accompanying sketch. The valve stem is soldered to the top of the tank, over an opening approximately as large as the hole through the stem. The copper tubing and connection remain as they are found when taken from the car. Oil is placed into the can and pressure stored by forcing air through the valve with an ordinary hand pump. Oil is forced through the tube and into spring by opening the outlet.—Everett Folger.



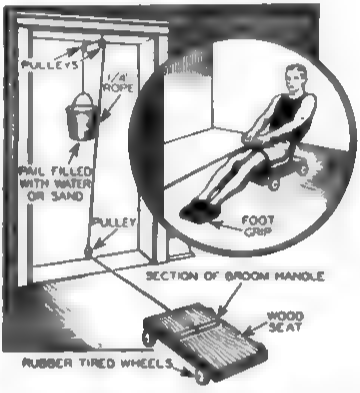
New Ideas for Home Handymen



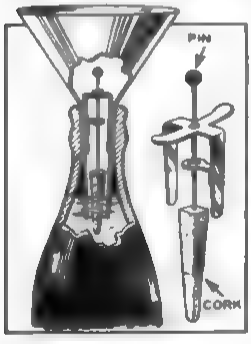
Spring Keeps Socket, Pull Chain Intact

THE pull chain on a light socket is usually subjected to a lot of jerking and in time begins to show the results in loose contacts and general dilapidation. There's a way to preserve the socket against the effects of the jerks, however, and that's to cut the chain or cord about in half and insert a spring, as illustrated in the accompanying drawing. A small spring will suffice, no great tension being required. With the spring in place, the jerk on the switch in the socket is padded, so to speak, so that no strain is placed on the mechanism. In addition, the chances of breaking the string is greatly reduced, since it, too, is relieved of the severe stretching it gets at the hands of "light turners-on." If no spring is available a number of rubber bands may be used instead.—Bill Baddin.

Rowing Machine Easily Constructed



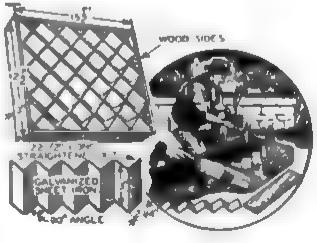
HERE is a compact little rowing machine which is simplicity itself. The pulling apparatus can be erected in a doorway, as illustrated in the accompanying drawing, and consists of about 5 yards of ¼ in. rope, three pulleys, a pail and a footboard. Attach the pulleys as shown in the doorway, then slip the rope through them and tie the pail to the dangling end of the rope. The pail can be of any size, the amount of water poured in it determining the tension of the pull. The floorboards should be slanting and removable, a couple of straps serving as floor grips. As to the sliding seat, an ordinary board is cut to size and equipped with broom handle axles and wheels from an old vacuum sweeper to prevent marring the carpet. The whole apparatus can be put out of sight when not in use.—J. F. Byrne.



Small Cork Float in Funnel Tells When Bottle Is Full

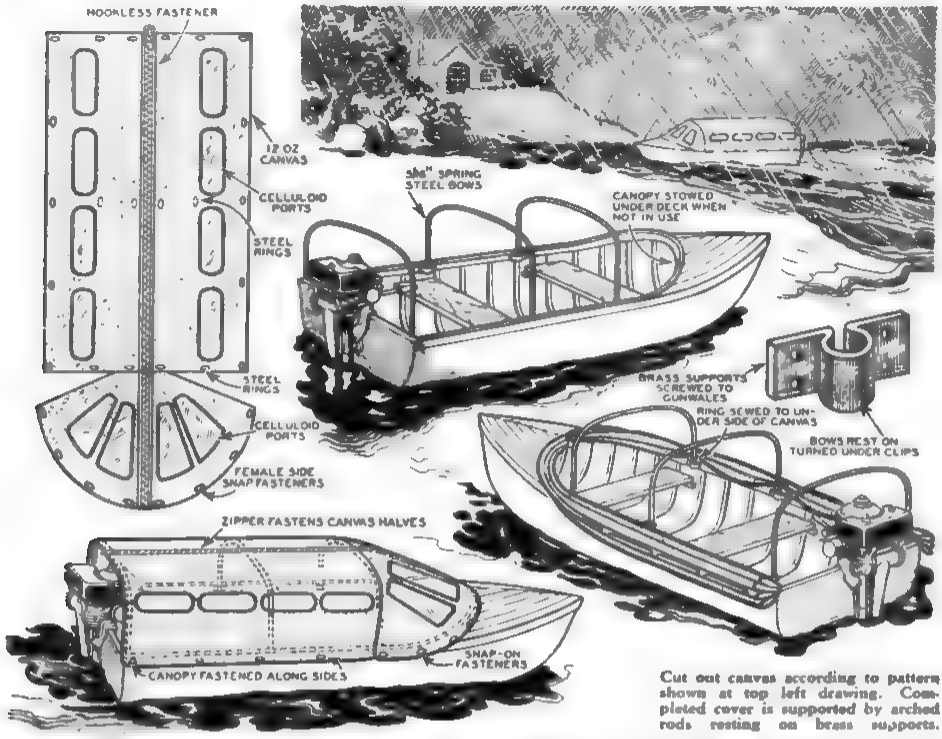
MOST housewives know what a mess is made when a bottle spills over into which a liquid is being poured from a funnel. This accident results in most cases because it is impossible to tell just when the bottle is full. Here is a solution to the difficulty. It's simply a kind of buoy that fits in the neck of the funnel, as illustrated in the accompanying drawing. First, cut out of a piece of sheet brass or copper a support of about the shape shown in the drawing, and solder to the lower section a guide. Then procure a cork and cut it down to the shape illustrated. Hold the cork under the guide and drive into it a long round-headed pin of a suitable length, which you will have to determine by experiment. In use, when the bottle is full, the cork rises causing the head of the pin to rise, announcing that the bottle is sufficiently full. A funnel with an oversize spout works best with the buoy.—Weston Walton.

Transplanting Box Facilitates Removal of Plants Without Root Damage



GARDENERS will be quick to see the value of this little kink to facilitate transplanting. The stunt makes use of a box in which the dirt is divided into sections, so that plants which are ready to take to the earth can be easily removed with a minimum amount of damage. The box has the dimensions shown in the accompanying drawing. Partitions are made of strips of galvanized iron, 22½ in. long and 3 in. wide, bent every 2¼ inches, zig-zagging back and forth as illustrated. Eight of these partitions will be needed. When making the box leave one board so that it can be taken off easily for removal of the plants. When plants are ready for transplanting, remove the end board and plants will slip out easily.—Charles Jensen.

Emergency Cover for Motor Launch



Cut out canvas according to pattern shown at top left drawing. Completed cover is supported by arched rods resting on brass supports.

TO BE caught in a sudden thunder storm in an open boat is not a very enjoyable experience—and certainly is a damp one. This experience can be avoided by making the simple canopy top shown in the sketches above.

Not only is this suitable to the family boat at the summer cottage, but also to those who take a vacation boating trip. A bed can be made up across the seats and the canopy affords shelter at night.

The first step in making the top is to shape the steel bows. Usually three bows are enough. These are made of 5/16" spring steel or a cheap grade of tool steel. They should be shaped so as to give reasonable head-room, and at the same time conform to the curve of the sides and bottom of the boat when stowed away.

The bows are held in place by inserting the ends in brackets screwed to the inside of gunnels. An insert drawing shows these brackets. It is best that they be cast of brass or aluminum, but heavy sheet metal brackets will serve.

After the bows are in place, the canvas is shaped. Water-proofed, 8 oz. canvas is heavy enough. The pattern is shown solely to give a general idea of the layout. Modifications must be made to meet individual requirements.

Oblong, celluloid portholes are cut in the canvas. Of necessity, these must be narrow to permit folding of canvas. The lower, front edge of the canopy is secured to the outside of the coping around the forward decking. The lower edges on the sides are fastened to the outside of the gunnels. Snap, or "jiffy," fasteners are used at both these points.

After the canopy is completely shaped, it is split up the middle its entire length, and hookless fastener strips are sewed to the edges. Hookless fasteners—any length—can be bought at any well-stocked department store.

In clear weather, the canvas is folded and stored under the forward decking, and the bows are sprung against the sides and bottom of the boat as shown. When weather threatens, the bows can be set up and the canvas can be draped along the gunnels as shown in one sketch.

If a storm breaks, the clip of the hookless fastener can be pulled, and in a jiffy the boat is closed in as snug as "a bug in a rug." A flap should cover the hookless strip on the top to make it rain-proof.

Any handy man can make this canopy for a few dollars, and it is money well invested, for it adds many dollars value to the boat.—Dick Cole.

For Smokers—Cigarette Holder Has Its Own Ash Tray

Housewives will appreciate this cigarette holder, for it has tray that catches the ashes as they fall, thus keeping unsightly messes off the floor. Handle eliminates stained fingers.

A CIGARETTE holder designed to serve two purposes, that of ash tray and holder, is the invention of H. E. Adams, of St. Louis, Mo., who conceived the idea after his wife complained of the amount of ashes strewn on the carpet floor.

The cigarette is inserted into the device and smoked in cigarette holder fashion, while the ashes fall in a tiny receptacle beneath it, as demonstrated by the young lady in the accompanying photo. The metal never becomes overheated and the ashes stay in the holder until the smoker is through.

Another advantage, one which the ladies will appreciate, is that discoloration of the fingers is avoided, since the holder is supported by a small handle.

5 H. P. Motor Runs "Trolley-ferry"

ALTHOUGH a member of an old-fashioned institution, the ferry boat across the Sacramento river, joining Celusa and Glenn counties, in California, has taken on modern ideas. It has been electrified, and instead of the traditional gas motor, it has a five h.p. electric motor which takes its power from an over-head trolley cable, as shown in the photo below. The motor runs a set of gears which haul the ferry back and forth along a half-inch cable which spans the river. To stop or start the ferry the operator has only to press a button. The trolley cable is merely a one-inch anchor cable connected to a power line on the river bank.

Electric motor taking power from overhead trolley replaces gas motor in modernized ferry across the Sacramento river in California. Boat starts, stops, by pressure of control button.

How to Save Wear on Golf Pants

HERE'S a timely tip for golfers who carry bags with the convenient zipper fasteners. These zippers usually take a heavy toll of golf pants, wearing out the section just above the hip pocket with a merciless rapidity. The best thing to do in a case of this sort is to sew a piece of leather on the part of the pants which have to take the punishment. How this stunt is performed is illustrated in the accompanying photo. Some well-resined thread and a shoemaker's awl is all you need for the job. In case you wear linen golf knickers, you can substitute a piece of canvas for the leather.

Excessive wear on golf pants is prevented by sewing on piece of leather in position shown above.

Blood Vessels Burst When You Cry

HOW the red, bloodshot spots that sometimes appear suddenly in people's eyes may be caused by severe muscular exertion, by holding one's breath or by weeping, while wearing a collar that is too tight, has been explained by a distinguished London specialist.

These spots are produced by the rupture of one of the small blood vessels just underneath the front surface of the eyeball, blood vessels ordinarily so small as to be almost invisible. Anything that increases the blood pressure in the neighborhood of the eyeball may burst one of these small vessels so that the escaped blood makes a red spot on the eye's surface.

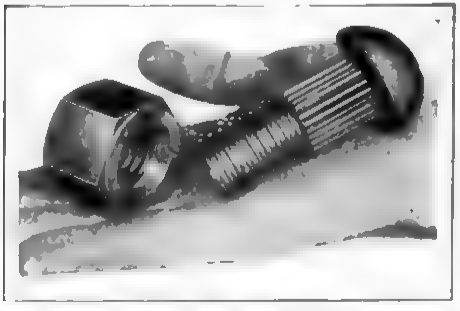
A tight collar often tends to restrict the return of blood from the face and head through the large veins on the sides of the neck, so that the blood pressure rises and a vessel in the eyeball may burst.

Plane Communicates with Land by Television

At right are seen television engineers bringing in picture of girl on television receiver in plane flying 6000 ft. over Los Angeles. Movie strip at left is picture that was successfully transmitted in tests to develop television direction finder for planes.

Gone—the Clatter of the Riveter

ELIMINATION of riveting clatter is claimed for a new type cold rivet that is applied by an ordinary five-pound hammer instead of compressed air. Made of common bolt steel, the rivet is inserted in the hole in the steel in the ordinary manner, and then a few hammer blows delivered to the head, causing the ribbed neck of the rivet to cut into the edge of the hole and make an extremely tight fit. Finally a self-locking nut is applied to the other side of the rivet by means of a wrench. It is claimed that the rivet cost cuts erection costs more than 50 per cent.



Blow on head of "silent" rivet, shown here, expands ribbed neck, providing a firm grip in hole. Self-locking nut tightens over other side to hold rivet forever and firmly in place.

IN AN experiment that may change all present methods of plane-to-land communication, television engineers recently transmitted a picture of a pretty girl from a station on the ground to a receiver in the cabin of a passenger plane flying 6000 feet above Los Angeles.

The picture of the girl was projected into the ether on the ultra-high frequency of 44,500 kilocycles, or about 6 meters, employing only 150 watts of power. The plane cruised about the sky at various heights, speeds, and distances for the purpose of making an exhaustive test, but under all conditions the pictures came in bright and distinct.

The photo above shows the receiver on the plane. The test was made under the supervision of Harry R. Lubcke, technical engineer of Station KHJ, who hopes to develop a method of television direction finding whereby planes can find their way through fogs.

No Danger From Fiery Meteors

EACH day a thousand million shooting stars crash into the earth's atmosphere but are shattered to bits before they can do any serious damage. A shooting star, visible from the earth, is mostly hot air. When one of these celestial visitors strikes the atmosphere, there is such intense friction that the substance burns up, being consumed by heat long before reaching earth.

A Compressed AIR Motor

Fig. 1. View of compressed air motor-driven model plane in flight.

by DICK COLE

Here's a real model plane job. Sturdy in construction and driven by a powerful little motor, it makes long flights and stands the heaviest punishment.

AN EFFICIENT power plant, of course, is essential to the flight of a model aeroplane. Rubber-band motors are most extensively used, and, in diminutive models, computed on the power-per-ounce basis, they are without an equal.

But many of the miniature airplanes and powered gliders are not true aeroplanes, in the sense that they could be reproduced along the same line of construction into a full-size, man-carrying plane—they are merely flimsy, "inclined planes," and do not embody the advance theories of aerostatics.

Fig. 2. This compressed air motor may be small, but it's amazingly powerful—so powerful in fact that it will turn over a 10" prop for 2 minutes from air pressure of tank.

The present trend in airplane model building is to reconstruct an exact, flying replica of existing commercial planes, and this means that all the theoretical factors encountered in the full-sized plane are also met with in the model.

Fig. 3. This photo shows the motor secured to tip of tank-fuselage, with prop on shaft. Small size of motor cuts wind resistance to a minimum without loss of power.

Compressed Air Motor Found Most Efficient

A small gasoline motor might suggest itself as a suitable prime mover, but on the average-size model, with a four to five foot wing-spread, the weight-per-surface unit practically eliminates the use of a gasoline engine.

On models up to approximately five foot wing-spread a compressed air motor undoubtedly offers the most suitable means of propulsion. The building of a compressed air motor may, at first thought, appear to be beyond the scope of the amateur model-builder. However, anyone who has access to a small, metal turning lathe, and who can wield a soldering iron, can easily make this motor.

It is devoid of any gears, cams, auxiliary shafts—even of valves, in the accepted sense of the word. The pistons themselves serve as slide valves, somewhat similarly to the

Powers this MODEL Plane

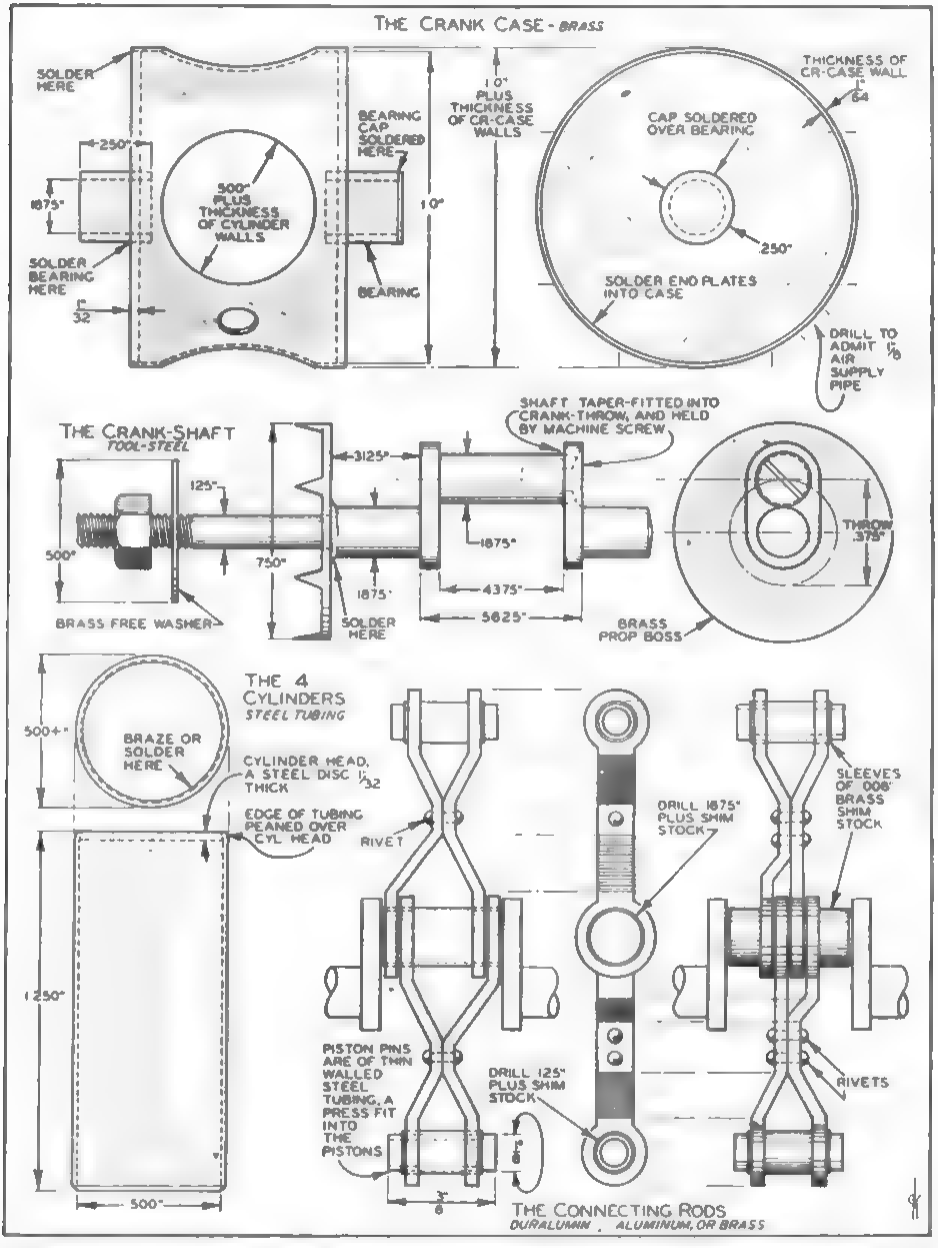


Fig. 4. Dimensions for all parts of motor save pistons are to be found above. Before turning down the tube for the crank case, it is advisable to bore the holes for the cylinders, about ½" being suitable size. Note that the crank shaft is built up of two pieces. One end of the crank pin is tapered to fit into a correspondingly tapered hole in the crank throw in the idle end, the parts being held together with a machine screw. The connecting rods, made preferably from duralumin, fit over a demountable crank-shaft, which is made necessary by method of assembly. The cylinders should be made from very thin-walled steel tubing, ½" in diameter. The tubing is dressed before being cut to cylinder lengths.

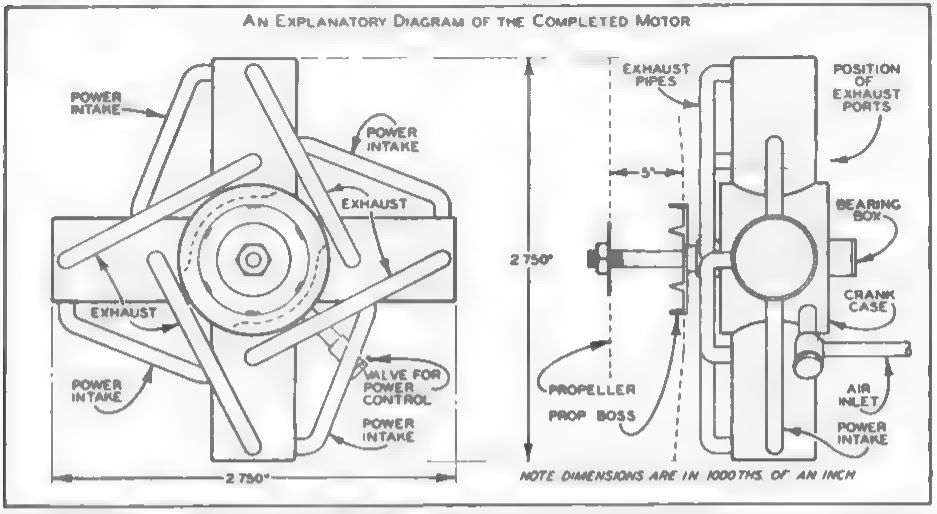


Fig. 5. General arrangement of the intake and exhaust tubes is seen in this drawing. These tubes are copper, ⅛" diameter, and are reamed out to make walls as thin as possible. Air inlet pipe leads into tank-fuselage, being soldered in place.

pistons of the two-cycle gasoline motor, except that each piston serves as a slide valve for the adjacent cylinder instead of for its own cylinder.

Fig. 5 visualizes the general appearance of the motor. It will be seen that it is a four cylinder radial type, and that small tubes connect the adjacent cylinders. These are respectively the inlet and exhaust pipes.

The bore of the cylinders is ½"—the stroke, ⅜". Each cylinder is of the single action type; in other words, the pressure is applied to one end of the piston only. But since the pressure at all times is applied to two pistons, the resultant power is equivalent to that of a two cylinder motor of twice the piston head area.

The four connecting rods are attached to a common crank-pin. Thus the movement of the pistons is so synchronized that there is no change in the crank-case displacement during their travel. Therefore, compressed air can be admitted to the crank-case, and, since the pressure against the pistons is balanced, no movement results.

Study Cycle Chart Before Construction

In this motor, the compressed air is first admitted to the crank-case. Now let us see what becomes of it. This is best shown in Fig. 8.

A study of this cycle chart will reveal that while one pair of opposed pistons are making a complete stroke in one direction, the pair of pistons at right angles move from the middle of the stroke to the extreme end and back to the middle. During this period of travel the skirts of the pistons uncover ports which communicate with the adjacent cylinders, and serve respectively as inlet and exhaust valves.

Exhaust System of the Cylinders

Anyone familiar with the technique of the two cycle motor will recognize the feasibility and practicability of this construction. A unique feature of the motor is that each cylinder exhausts through the hollow piston pin of the adjoining cylinder.

Reference to the drawing in Fig. 8 shows clearly how this is done, and also shows the relative position of the pistons throughout a complete revolution of the motor. One should study this plate and thoroughly acquaint one's self with the principle of operation before beginning the actual construction.

Fig. 4 gives the details of the essential

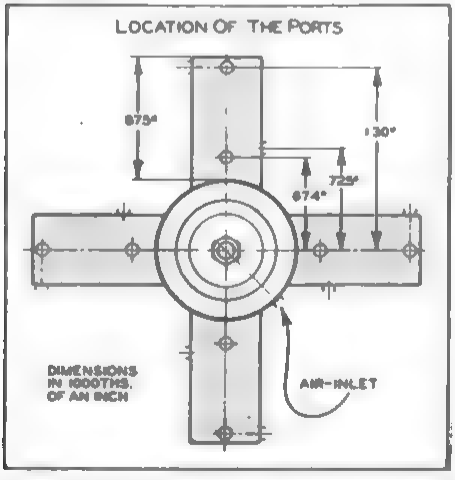


Fig. 6. Ports are laid out as shown in this drawing. Note that dimensions are given from the center line of crankshaft.

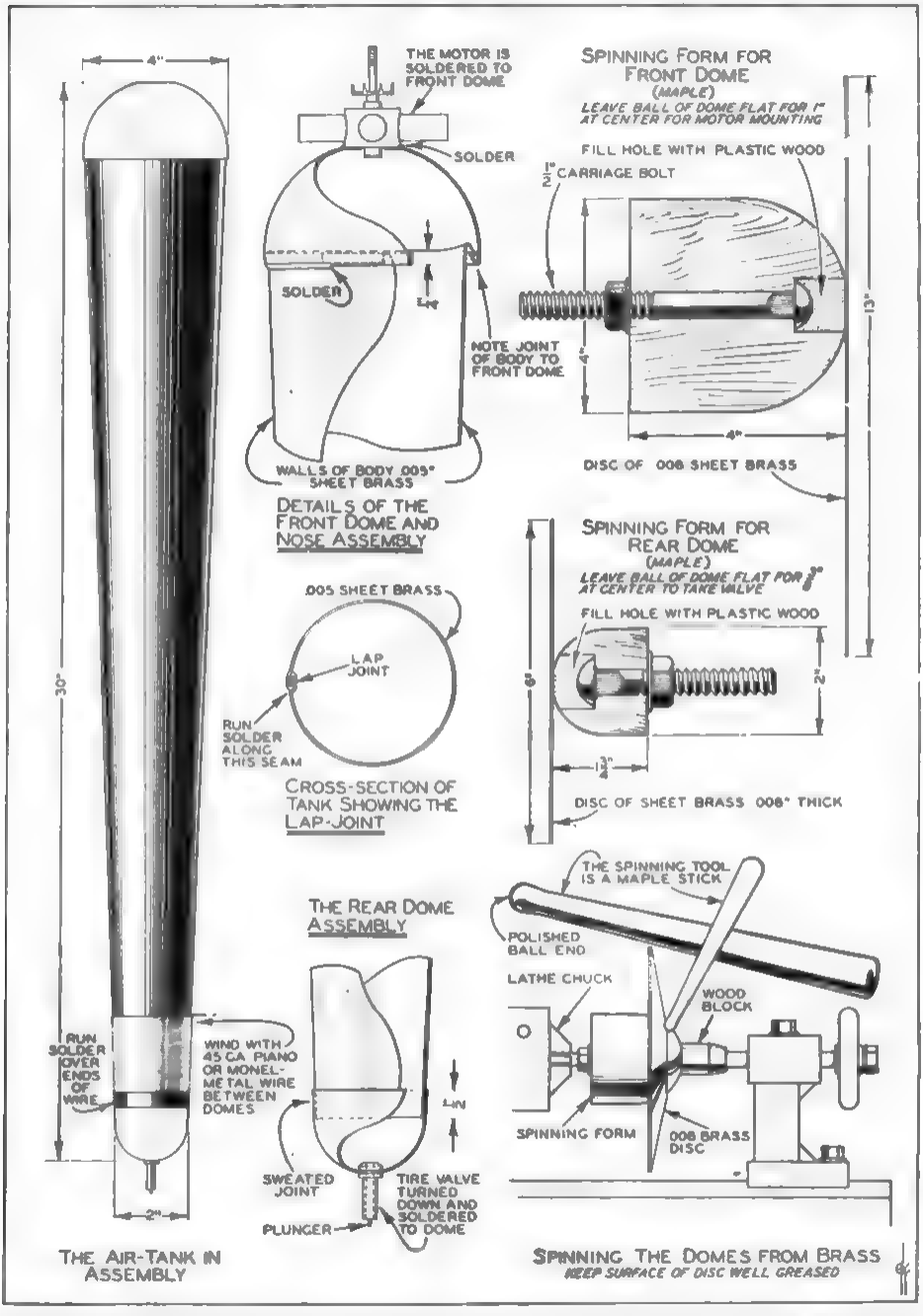


Fig. 7. Constructional details for the metal tank-fuselage, which holds up to 100 lbs. of compressed air. Note particularly method of shaping end domes. During this process it will be necessary to anneal brass several times. Forward dome, which takes the motor and its air inlet tube, must be soldered in place, while the after dome, which holds the intake valve, is sweated on. To strengthen tank to withstand heavy pressure, 45-gauge "monel metal" wire is wrapped on as illustrated, first quarter-inch or so being soldered. Motor is soldered on front, air feeding directly into crankcase.

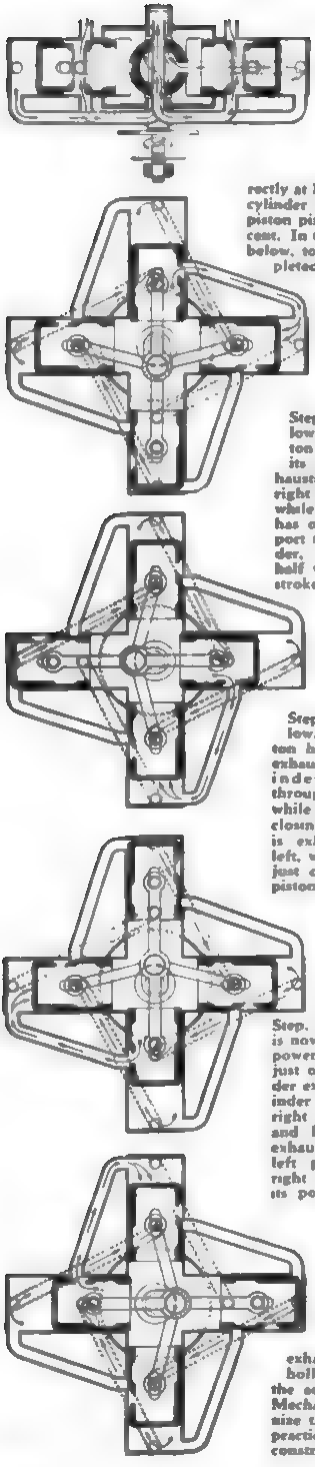


Fig. 8. This cycle chart shows complete piston action of the compressed air motor. The semi-cross section view directly at left shows how one cylinder exhausts through piston pin of cylinder adjacent. In the first step, shown below, top piston has completed power stroke and has opened port supplying air to right cylinder. Left cylinder is exhausting through the top piston pin.

Step No. 2. Left, below. Here the top piston is part way up on its stroke and is exhausting through the right piston pin. Meanwhile the right piston has opened the supply port to the lower cylinder, which has gone half way on downward stroke. Residue of air in the left cylinder is exhausted into piston of the top cylinder.

Step No. 3. Left, below. Now the top piston has completed the exhaust stroke, the cylinder exhausting through right cylinder, while pin is in act of closing. Lower cylinder is exhausting through left, while piston pin is just closing. The left piston is receiving power through lower piston port, and is just about to open top supply port.

Step. No. 4. Top piston is now coming down in power stroke, and is just opening left cylinder exhaust. Lower cylinder is just closing right cylinder exhaust, and lower cylinder is exhausting through the left piston pin. The right piston has closed its ports, and the left piston has completed its power stroke. This action now completes the cycle. In studying this chart you will notice that each cylinder exhausts through the hollow piston pin of the adjoining cylinder. Mechanics will recognize the feasibility and practicability of this construction.

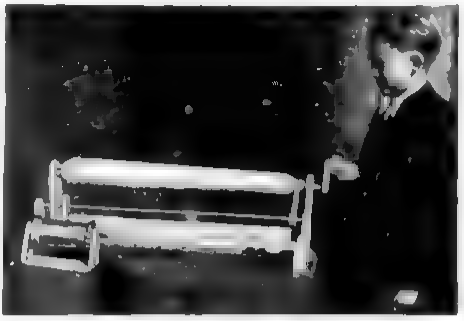


Fig. 9. With this simple jig, winding the "monel metal" wire around the tank-fuselage is a speedy and easy job.

parts of the motor. It is well to mention that the methods of construction are not offered as a fixed standard—rather they are offered as suggestions to aid the amateur mechanic with limited home workshop facilities.

First we will take up the construction of the crank-case. It consists of a ¾" length of brass tubing approximately 1⅛" in diameter. (All the dimensions on the drawings are given in thousandths of an inch. In the text they are quoted in fractions for easier reading.) The inside of the tube is dressed out, and it is then turned down to leave a wall of about 1/64".

Construction of the Crankcase

The exact dimension of the diameter is immaterial, as the side plates of the crank-case can be turned down to fit snugly inside. The side plates are machined from brass stock to a mean thickness of 1/32". Crank-shaft bushes, integral with the side plates, are turned down at the center.

It is best to bore the holes for the cylinders before turning down the tube. About ½" is a suitable size. This is under-size, but it can be scraped out to exact size when fitting the cylinders. The hole for the crank-shaft is 3/16".

The two holes should be accurately line reamed with both plates in place. They can be temporarily soldered in place during this operation, but can not be permanently soldered until the motor is ready for final assembly.

Crankshaft Machined From ¼"x¾" Steel Bar

Next we will consider the crank-shaft. This is machined from steel bar ¼"x¾". Note that the shaft is made up of two pieces. One end of the crank pin is tapered to fit into a correspondingly tapered hole in the crank-throw on the "idle" end. It is held in place with a machine screw.

This demountable construction is necessary so that the connecting rod bearings can be slipped over the crank pin. An amateur mechanic, without a suitable lathe, will have to have a machine shop make this shaft. It is advisable to have the crank-shaft

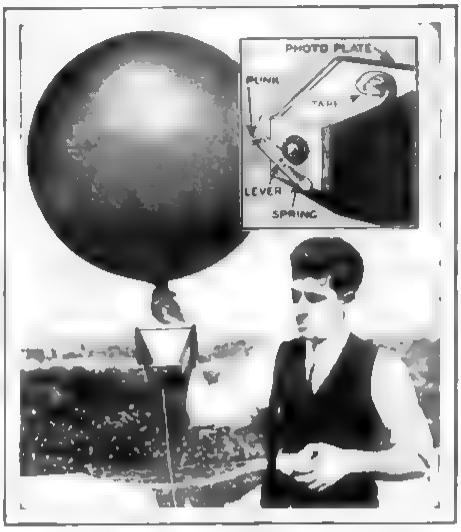
(Continued on page 148)

Automatic Self-Snapping Camera Makes Aerial Pictures

IF YOU have access to a moderate size sounding balloon, and are adept with a few tools you can easily rig up an aerial camera for taking pictures at a high altitude.

The body of the camera consists simply of a pyramidal-shaped box, truncated about as shown in the accompanying photo. In the bottom of the box attach a slot to take the photographic plate, and in the top affix your lens.

The trick of this system consists of clever lever-tripping device, which is contrived as illustrated in the drawing. On a piece of wood secure a spring, to the end of which is attached a piece of string and the shutter control lever of the lens. Now wrap this string around a piece of punk as shown, light it, and send the balloon aloft. When the punk burns down it will release the string and snap the shutter.



In making the aerial pictures the home-built camera is suspended from sounding balloon as illustrated here. When punk burns down, string releases spring to snap shutter.

Makes Diamonds at $5 Per Karat

AT LAST man has learned to perform a stunt which it takes nature thousands of years to perform—that is, to manufacture a diamond.

This amazing feat was performed by a new process developed by Professor Ralph McKee, head of the chemical engineering department of Columbia University. The manufacturing process makes use of the furnace shown in the photo below, in which iron containing carbon, silicon and phosphorus is subjected to terrific heat and enormous pressure. The diamonds are not suitable as jewelry, however.

Prof. Ralph McKee with the furnace which he employs to turn out 1-20 karat diamonds at cost of only $5 per karat.

Motorized Eraser for Draftsmen

A SERVICEABLE electric motor, small and light enough to be held comfortably between the thumb and forefinger, has been developed recently for use by draftsmen in erasing pencil and ink lines from drawings. The new electric erasing machine operates from the house lighting circuit, and consumes less power than a 30-watt lamp. It weighs less than one pound. Various types of rubber erasing tips are used with it for removing lines from such different materials as drawing paper and waxed tracing cloth.

High speed erasing is possible with this motorized eraser. The motor weighs one pound.

How Hail Halted Rat Invasion

A PLAGUE of rats which has been notable in parts of northern India was ended recently in part of the afflicted area by a remarkable hailstorm which swept over the country near Allahabad. Millions of rats apparently were killed outright by the hail so that fields are reported as strewn with a mixture of dead rats and giant hailstones. At least five human beings were also killed by being struck with hailstones. This part of India is known to grow larger hailstones than any other part of the world.

Three Saws in One With These Interchangeable Blades

Each saw has three interchangeable blades which are replaced as demonstrated. Vacuum grip holds blades in place.

CARPENTERS can put to good use a new saw which has been perfected by a San Francisco inventor. Having interchangeable blades, and thus constituting three saws in one, the tool means a saving of considerable box space for workmen who are compelled to carry two and three saws on the job.

The blades can be removed and replaced in a few seconds. When a blade becomes dull, instead of wasting time on the job at filing, the carpenter merely takes a nail set and pries the edge off, which incidentally is held in place by an almost perfect vacuum. With a new blade in place, the worker is ready to go back on the job.

Auto Fatalities Increasing

NEW YORK State kills more people in automobile accidents than any other state in the Union but its record is improving. California, on the other hand, not only kills as many citizens as New York, but is getting worse. The best record in the prevention of accidents goes to New Mexico, where fatalities have decreased something like 50 per cent. Other states showing the large increase in automobile accidents are Wyoming, Oregon, Montana and South Dakota. Number of autos, however, has increased more rapidly in these latter states.

Hold Down That Shirt Front

SHIRT fronts that won't stay put make an awful nuisance of themselves, but an inventor has mastered the situation by perfecting a metal fastener that attaches to the shirt front. On the bottom of this fastener there is a metal button hole that fastens to a button on the pants, thus holding the cloth down where it belongs.

Shirt is held down by fastener which is secured to button on pants. Elasticity of device prevents tearing of shirts.

Rubber Post Gives in Collision

AUTOS frequently crash smack into the unyielding solidity of traffic sign posts and sustain severe damage. To prevent such accidents traffic experts in the little town of Dusseldorf, Germany, have erected posts made of rubber, blown up like pneumatic tires. When a car runs into these posts they politely bend over and let the car pass without inflicting the slightest injury whatever. In fact, they have proven so satisfactory on the job that they are being erected in many of largest German cities.

Traffic post made of rubber gives as demonstrated here when struck by auto. The post is blown up by air like pneumatic tires and stands the severest punishment from cars.

Deadlier Gases in the Next War

IN THE World war soldiers stood in great fear of mustard gas, but in the next war they will have even greater reason to be afraid of it. For mustard gas has been made 30 per cent more effective. While the old type of gas usually took about 12 hours to render a soldier hors de combat, the new gas burns him out of action in less than six.

Lewisite, a new gas developed late in the World war and not turned loose until the Argonne campaign, promises to be even more deadly.

Things to Make with Tools

Edited by A. NEELY HALL

Ornamental Wall Bracket for English Ivy

THE English ivy is a well-known climbing shrub of the evergreen variety that always adds beauty to a dull background. A potted ivy plant is made more attractive when placed in a well designed wrought iron bracket and can be conveniently hung in any desired location in the house, in the sun parlor or on the porch.

This hammered iron bracket with graceful curves can be made from 6 ft. of wrought iron 5/16-in. square and two 6-penny nails for the rivets. To begin, lay out the design for the two sides and the top of the bracket on a piece of wrapping paper. Hammer the iron on all sides with a ball pein hammer to give it a pleasing appearance. Then cut the iron into three pieces having dimensions of 31 in., 22 in. and 19 in. respectively.

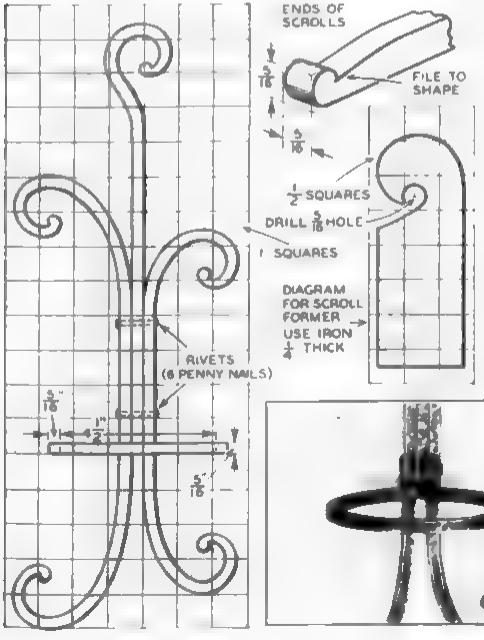
The first bending operation is the ring in which the pot hangs. The ring illustrated has an inside diameter of 4¼ in. but that dimension may be varied to suit any particular pot. The iron can be bent cold but will work much easier if heated red hot, especially when bending the right angles of the middle piece.

Prepare the ends of the irons as shown in the drawing below before bending the scrolls. Use a vise and files to prepare the ends of the scrolls. To bend the scrolls accurately, it is recommended that a former be prepared from a piece of iron. Get a piece of scrap iron ¼-in. thick and with other dimensions large enough to make the former as illustrated below.

Mark the design on the iron and drill a 5/16-in. hole at the point indicated. Saw out the design roughly with a hack saw and shape accurately with files. Clamp the scroll former in a vise and bend the five scrolls as shown in the diagram. Here again the iron will bend much easier if heated red hot. Shape the three pieces in general and test on the prepared diagram.

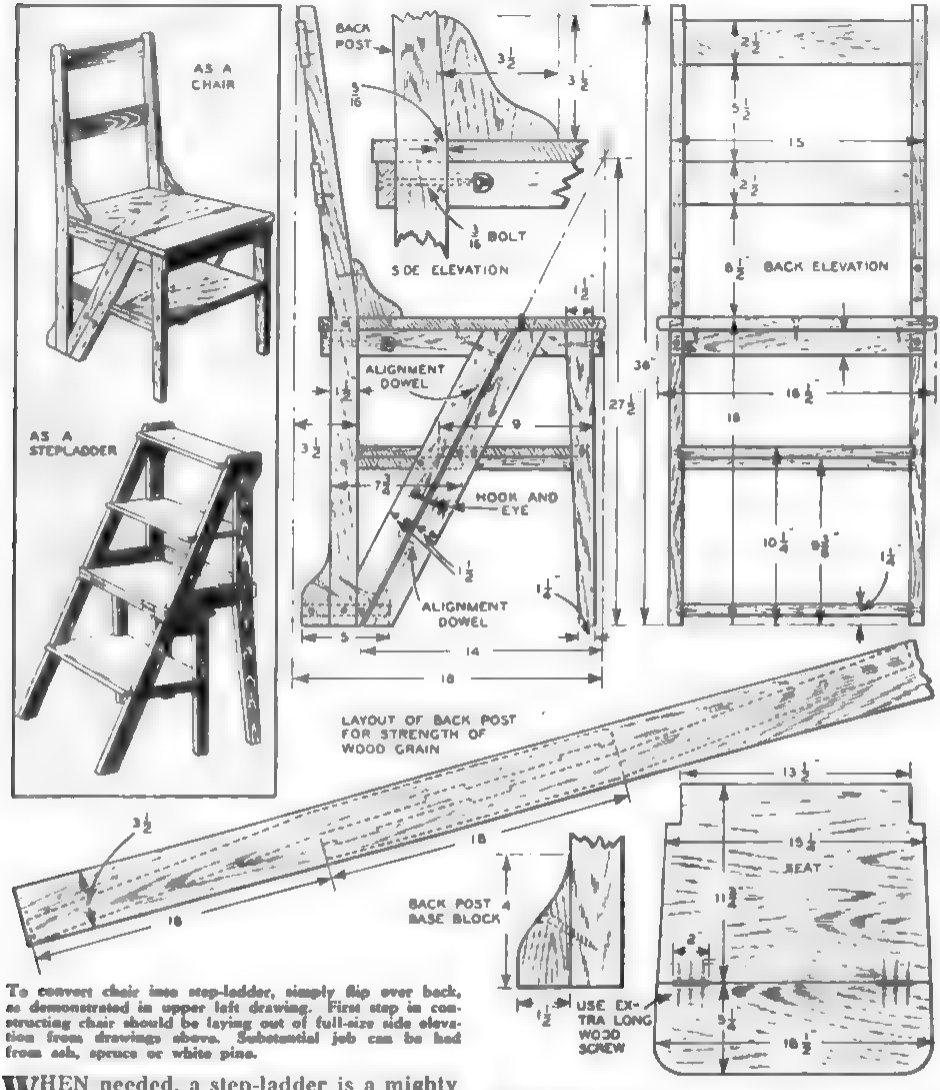
Drill the holes as indicated and rivet with two 6-penny nails cut to the required length.

File out the high lights and clean the iron with fine sandpaper. Apply several coats of clear lacquer to preserve the natural iron finish.



Squared chart at extreme left illustrates shaping and assembly of the wall bracket. Ends of scrolls are formed by bending them in the special former made from scrap iron ¼" thick. Center scroll should be bent into hoop to support the pot containing the ivy plant. Attractiveness of the plant holder can be seen in above photo.

Step-ladder Changes into Chair, Vice Versa



To convert chair into step-ladder, simply flip over back, as demonstrated in upper left drawing. First step in constructing chair should be laying out of full-size side elevation from drawings above. Substantial job can be had from ash, spruce or white pine.

WHEN needed, a step-ladder is a mighty handy device; but when not in use, it is the most clumsy, superfluous article one can have around the house.

Even its steps can't be used for shelves; they slope when the ladder is folded. If one owns a conventional step-ladder, it is probable that all the neighbors borrow it, and when one wants it for himself, it's over "at Lizzie's house."

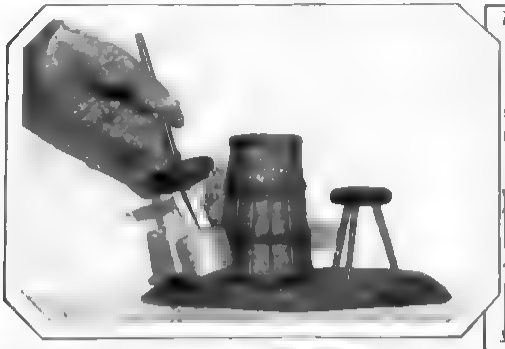
Here's a step-ladder which stores away "by conversion." When not a step-ladder, it's a chair. Not an artistic master-piece of the chair-maker's art, but at least a utilizable piece of furniture for the kitchen or the back porch.

The drawings above should make the construction of this novelty obvious to the builder. If one possesses power-driven home workshop units, building this article is just a pastime. The best way to go at the job is to lay out a full-size side elevation from the attached drawings. Then all the angles will form naturally, and the pattern can be transferred to the wood.

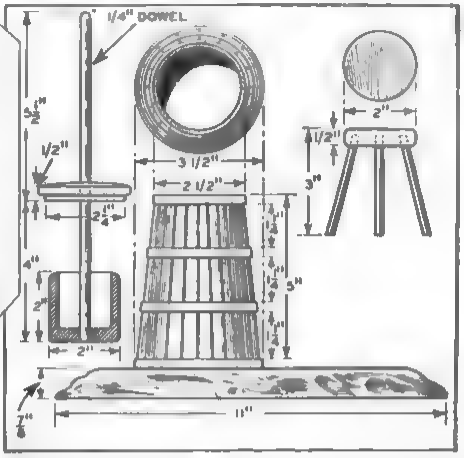
The specifications call for clear Oregon pine. But ash, spruce, or white pine can be used. It is well to avoid using heavy

(Continued on opposite page)

Unique Cigarette Holder Like a Miniature Relic Churn



Here is the completed churn, resembling the churns used years ago on the farm. Cigarettes, held in the cup-shaped dasher, may be taken out by lifting the dowel. Note comparison with hand.



Turn down container, dasher, top and stool seat on lathe to dimensions given above. You can shape bottom any way you wish, but it should have layer of felt underneath to prevent scratching of furniture. Secure churn to base with a wood screw, and form the staves with a veining tool.

THERE was a time, and not so many years ago, though many of you may not remember, when butter was made in old-time churns just like the one we are going to make. In fact, the very same type of churn can still be found in use in the mountainous sections of the United States. Yet, it can easily be considered a relic of the past and a curiosity.

It was a case of lift-the-dasher-and-put-it-down, lift-the-dasher-and-put-it-down, and so on until the butter formed on the top. Sounds easy, doesn't it? Well if you ever used an old churn back in the days before the coming of electricity, you'll remember that you found it necessary to change hands quite often.

It makes an interesting novelty, something many people have never seen, and utilizing it as a container for cigarettes makes it useful too. If you have a lathe you'll find it very easy to make.

Turn Out Parts on Lathe

Turn out the pieces according to dimensions in the drawing above. Mark off the staves on the churn, (you can do this by holding a square up to the churn and marking down its edge) and then go over the stave marks with a veining tool to a depth of about 1/32".

The legs of the stool are glued in shallow holes bored to receive them. The base is roughly cut to any shape you desire to make it and can be done on a band saw, jig saw or hand saw. After cutting it to shape go over it with a gouge.

Pins cut to 3/32" in length serve as rivets to hold the make-believe iron bands on the churn. Just hammer them into the wood. If your churn is a bit rough when you get through turning it out, use a little elbow grease and sandpaper. Then give the stool, the churn and the base a coat of fumed oak stain.

Finishing the Churn

Let it dry and then give it a coat of liquid wax. After it is dry polish it with a soft cloth. Secure the churn to the base with a wood screw. The stool can also be secured to the base. You can glue a piece of green felt on the bottom of the base to protect the furniture from being scratched. Detailed drawings explain construction, thoroughly.

Chair Back Flips Over, Changing Into Sturdy All-Purpose Step-ladder

(Continued from opposite page)

hardwoods—oak, maple, etc.—because the unneeded extra strength is more than offset by the clumsiness of the extra weight.

A point which must be stressed in building this article, is strength at the junction of the back posts and the seat. When used as a ladder on uneven surface, this point is put to great strain. A mortise and tenon job is desirable here, but without suitable workshop facilities this would be a rather tedious job. The bolted method shown will be found amply strong.

Another point where strength must be had is at the hinges. Hinges stamped from heavy steel stock should be used — not brass hinges—and should be put on with screws at least 1¼" long. When the outfit is set up as a step-ladder, it is often dragged from place to place. Then the hinges take the brunt of the strain.

When in the "chair" position, it may not be an ornamental piece of furniture, but at least it can be used on the back porch where the wife can sit and peel spuds and onions for the Irish stew. And maybe she can keep the knowledge from the borrowing neighbors that you even possess a step-ladder.

Sun Bathe at Ease on Simple BEACH Seat

SUN bathing is made complete with this restful seat with its reclining back which permits you to read in comfort, or, if you please simply to relax. The seat folds flat, making a compact outfit that can be stowed away easily in your car or carried under your arm. Though designed primarily for the bathing beach, the seat can be probably put to even better use in your back yard.

Two pieces of a 12-inch board, one piece 24½ inches long, for the seat, the other 26 inches long for the back, a scrap of a board for a bracket, strips for cleats and battens, hinges, screws and nails, and a can of enamel—these are the materials required.

Lay out the seat board and back board by the patterns given in the diagrams. All of the lines are straight which makes cutting a simple job of sawing.

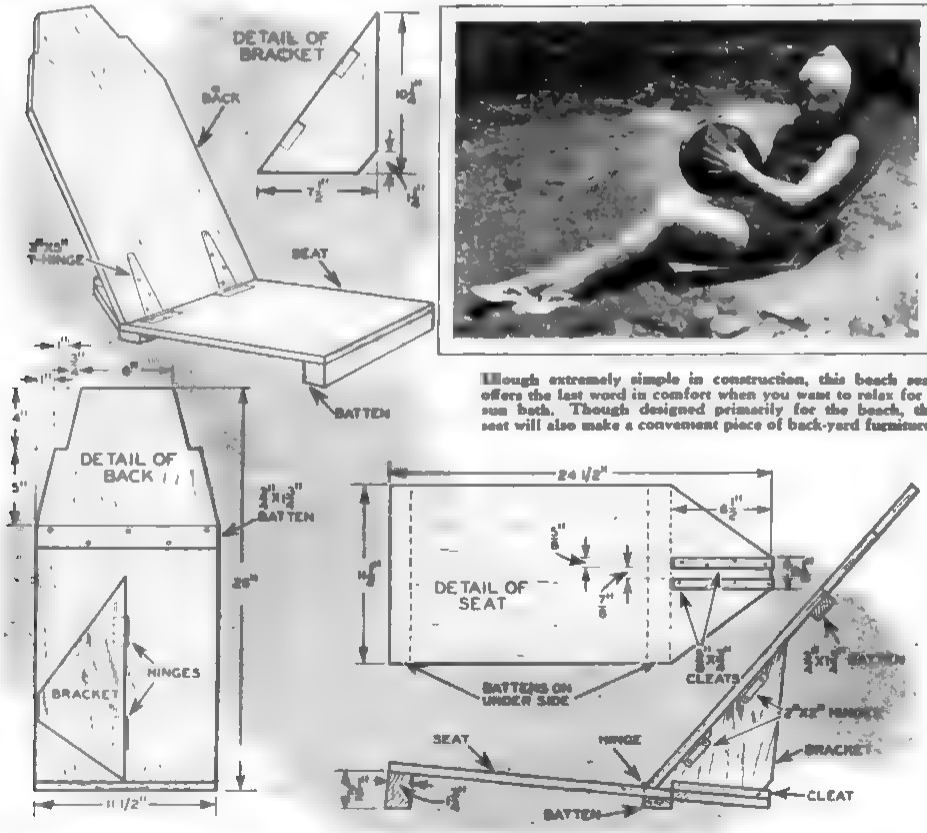
The seat board is battened on the under side with two battens. The pair of cleats upon the upper side, at the rear, form a pocket for the seat-back bracket to slip into. Fasten them at the points shown, ⅞ inch apart. The lower edge of the back is beveled at an angle determined by the pitch of the bracket. Make the batten at the front 2½ in. thick and the one at the rear ¾ in. thick. This arrangement is found best.

Lay out and cut the bracket before beveling the board. Let a pair of hinges into the side or edge of the bracket, and into the back board, as shown in the detail. The corner of the bracket is cut off so that it will not project when the bracket is folded against the back board.

Having hinged the bracket to the back board, and beveled the bottom edge of the latter, hinge the back to the seat with a pair of T-hinges or square butts.

You will want to finish the beach seat in a bright color, of course. How about orange? That was used on the model shown in the photograph.

Though extremely simple in construction, this beach seat offers the last word in comfort when you want to relax for a sun bath. Though designed primarily for the beach, the seat will also make a convenient piece of back-yard furniture.



Cut boards for seat and assemble them as illustrated in these drawings. Note particularly the bracket hinged to the back, which fits between cleats when seat is in use. Seat is given proper slant by front and rear battens secured in position shown.

Whisk Broom Holder Displays Picture of Favorite Dog

IT MIGHT be well to post a dog watch over your personal whisk broom, except for the fact that there are too many other possessions in need of similar guarding. The next best stunt is to provide a holder like that in the photograph, using the dog's head cut-out as a symbol of protection.

Such a holder leaves one no excuse for not returning the whisk broom after use, and has been found to end the necessity for that household cry of "who has whose's."

Use a picture of your favorite species of dog, if you wish. Indeed, if there be a good one of your own pup, have an enlargement made of the right size, and mount this upon a piece of plywood. A Scotch terrier is used in this model because of the present vogue for "Scotties." A pattern for this head is given in the diagram, ruled off into squares to simplify the work of enlarging.

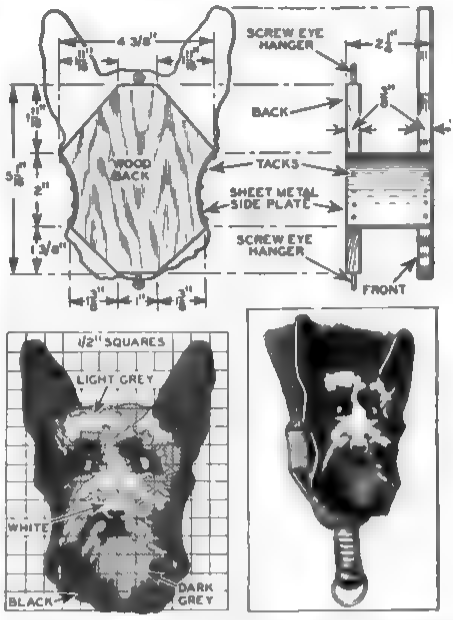
Reproducing Dog's Head on Holder

Lay out the dog's head upon a piece of ¾-inch or 5/16-inch plywood, saw it out carefully, and then finish it. A color chart has been added to the pattern to aid you in applying the finish. Lacquers or satin-finish enamels are best. Mix white with black to get the two shades of gray.

A pattern for laying out the back board of the holder is given in the detail of the back. Use the dog's head as a pattern for the curves of the side edges. The side pieces are of sheet metal. Galvanized iron will do. Cut them 2¼ inches wide by the right height to fit the curves of the front and back pieces of the holder. Shape them to the curves and tack them in place with round-headed brass tacks.

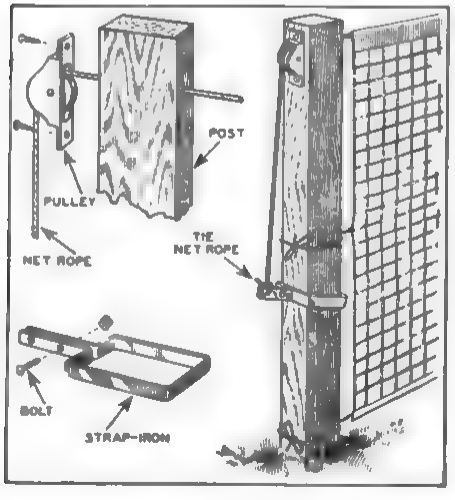
Screw a brass screw eye into the top and bottom edges of the back board, for hangers. Finish the back of the head and the side and back pieces of the holder white.

The completed holder is seen in the photo at the top. It's advisable to choose picture of dog with tall, sharp ears.



If you like terriers, use design for front of holder shown above. Cut back and side pieces to dimensions shown at top.

Simple Device From Strap Iron Grips Post to Tighten Up Tennis Net



Slack in net is taken up by pushing down strap iron frame, which grips post and holds cord taut. Post should be set firm.

WITH this tightening device installed upon the court posts, you can say good bye to slack tennis nets. The rig is simple to make. One inch below the top of the posts drill a hole large enough to admit the tennis-net attachment cord, and screw a window-sash pulley to the outer face of each post, with the wheel at the right height for the attachment cord to run over.

The tennis post must be firmly set in the ground. Four-by-four posts in holes thirty inches deep, with earth and concrete tamped down compactly, make a good job.

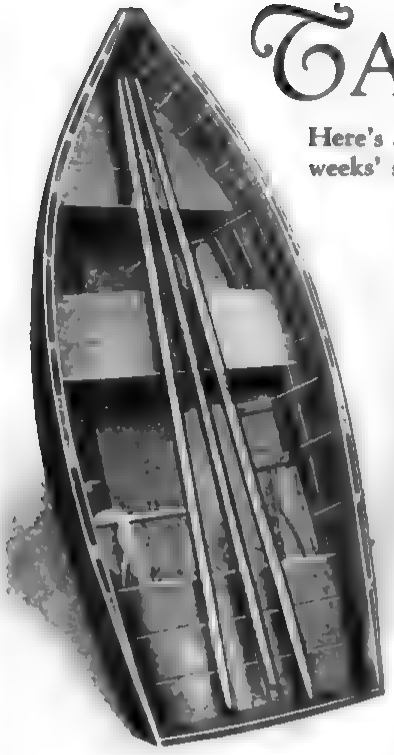
The tighteners consist of a square frame a trifle larger than the post, bent out of strap-iron 3/16 inch thick and 1 inch wide.

After shaping the square frames in your vise, bend the ends at right angles, as shown, and cut them off to project about 4 inches.

Drill two holes through these projecting ends, one for a stove-bolt, the other to fasten the tennis-net attachment cord to. To take up slack push down on the frame ends until the net is taut. The frames will bind on the posts at those points until released.

TAR BABY—a

Here's a V-bottom dinghy which you can build in two weeks' spare time at a cost of under $20. Seven feet long, she can seat four people and can be used as a sailboat, rowboat, or with an outboard motor. She's simple to build and no special tools are required.



Here is Tar Baby with mast, gaff and boom, all of the same length, conveniently stowed in her.

YOU can build this fine little V-bottom dinghy in two weeks' spare time, at home, with a few ordinary tools, and at a cost about one-fourth that which would be charged by a professional builder.

Tar Baby is first of all seaworthy and safe, she will keep you dry in choppy waters, she rows easily, sails like a witch, and will step along with an outboard motor. She is a lap-strake, V-bottom design seven feet long, and 42 inches beam. She will seat and carry three people comfortably, and four can be crowded in with safety.

Frames Are All Straight

All frames are straight pieces, require no bending, and the planking can all be bent by hand without steaming. An amateur with average knowledge of tools can build her from the accompanying plans, and when finished she will have all the earmarks of a professional job. All materials, including lumber, mill-work, screws, paint, and a towing rope will cost less than $20.00.

Tar Baby is normally a yacht or motorboat tender, and in this service will do as well, and look as good as a great many stock boats costing four or five times as much. But she is more than a tender, the addition of a centerboard and sail converts her into a fast and able sailing dinghy which will more than hold her own in the increasingly popular dinghy races.

The first step in the construction is to secure proper materials and tools. The necessary tools are few and ordinary, being a claw-hammer, a small hand drill, a saw, a jack plane, two or three carpenter's C-clamps, and a screwdriver. The materials are:

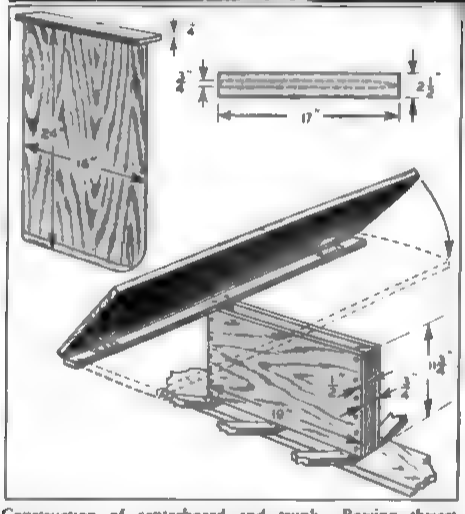
Ribs: 5 pcs. ¾"x1½"x8' clear spruce.
Chines: 2 pcs. ¾"x2"x8' clear spruce.
Stem: 1 pc. 3"x10"x30" white oak.
Transom: 1 pc. 1"x8"x6' clear yellow pine.
Bottom Planking: 6 pcs. ⅜"x6½"x8' white pine or cedar.
Side Planking: 6 pcs. ⅜"x5"x8' white pine or cedar.
Keel: 1 pc. 1"x5"x8' white pine or cedar.
Rowing Thwart: 1 pc. 1"x12"x3' white pine or cedar.
Seats: 3 pcs. 1"x5½"x6' white pine or cedar.
Clamps: 2 pcs. ¼"x1¾"x8' white pine or cedar.

Fitted with a sail which can be stowed in the boat when not in use, Tar Baby will step out with the fastest of 'em

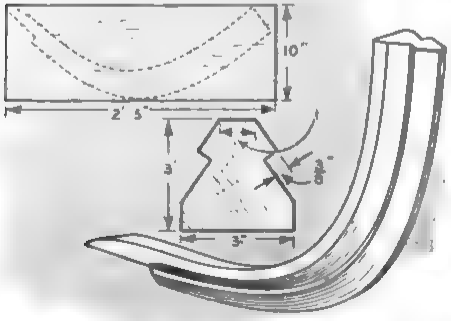
Midget Dinghy

by WALTER E. STEWART

Tar Baby makes an excellent rowboat, and an outboard motor can easily be attached. Three can be seated comfortably; four can, however, crowd in without any danger.



Construction of centerboard and trunk. Rowing thwart is hinged to be tilted out of way when removing board.



Stem is cut from white oak to dimensions shown. The mill will rough this piece out for you at slight expense.

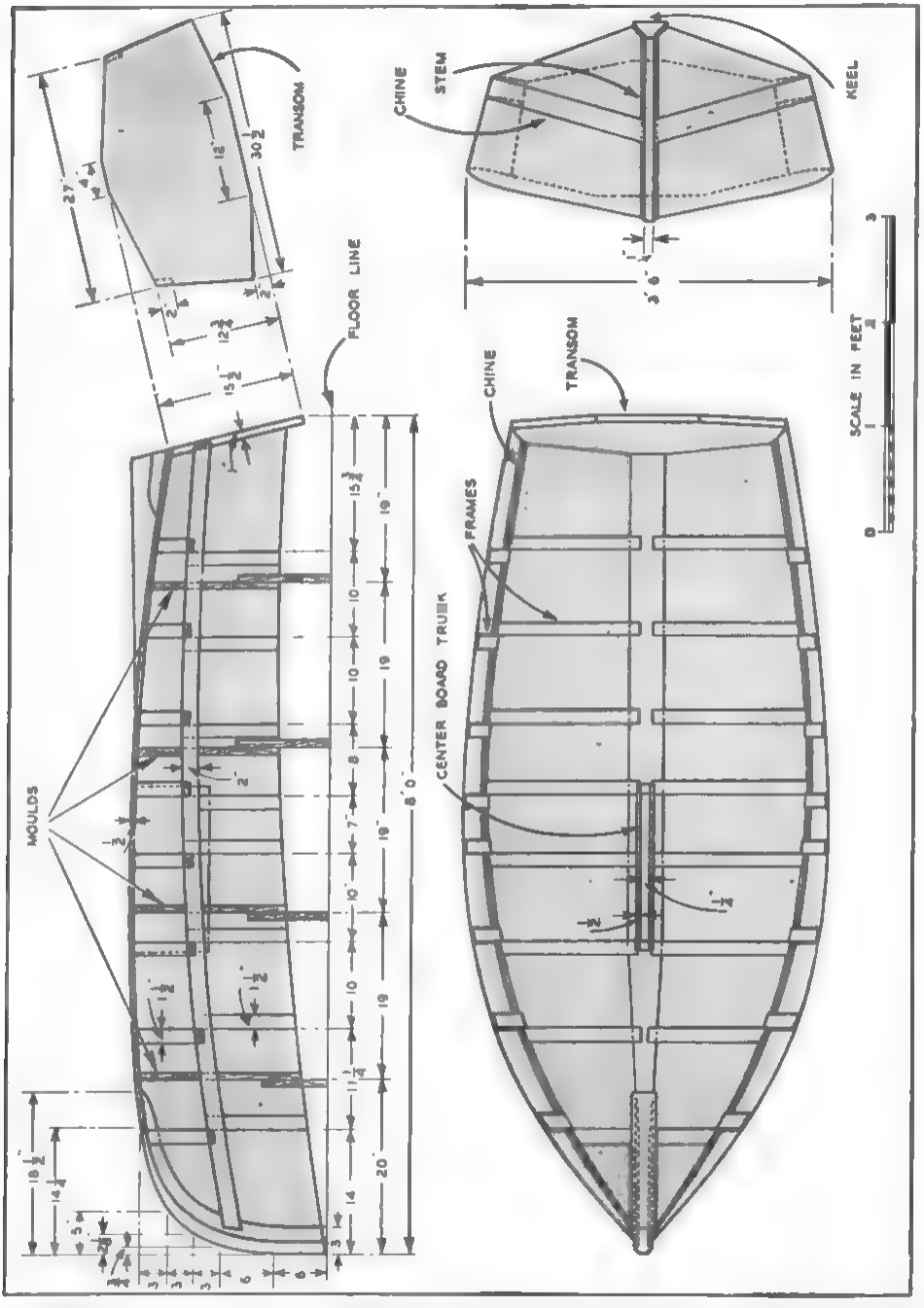
With the materials together, you start by making up the moulds according to the dimensions shown on page 118. Scrap lumber, old packing cases or other material will serve as moulds, since these are to be discarded after the permanent frames are put in place. Set the moulds up as shown on page 116, making certain that the distances between them are correct, and that they are vertical.

Transom Made From Yellow Pine

The stem is cut out of your piece of white oak according to the dimensions given. The mill where you obtain your material will rough this piece in for you for about $1.00, and you will find the time you save quite worth it.

Make the transom, or rear end of the boat, from the one inch yellow pine. The edges of the two planks which are the transom should be shaped so as to form a V-crack, with the opening towards the outside of the boat. This seam is later caulked. Set the stem and transom in their respective places, and the general form of the boat will be seen outlined.

Next, screw the keel, which has been shaped according to the drawing, to the stem and transom. Then fasten the two chine pieces to the stem and bend them around the moulds so that they fit in the notches at the corners. Their ends must then be screwed firmly to the transom. A piece of rope is handy to hold the chines in place as they are being fastened. To the chines and keel you next screw the bottom



This drawing shows how the moulds are set up and gives dimensions for the transom, which is cut from one-inch yellow pine. When setting up the moulds, make sure that the distances between them are correct, and that they are perfectly plumb. Scrap lumber is satisfactory for moulds, since these will be discarded when the permanent frames are in place.

frames, or ribs, and you are ready to start the planking.

One of the ⅜"x6½"x8' white pine planks is laid down beside the keel and held in place by a clamp. The curvature necessary to make the plank and keel fit can be marked off free-hand by lining them up by eye. Shape the plank with the jack plane, remembering that this first seam is "carvel" or flush, and that a V-crack must be left for caulking.

Use Clamps in Planking

Cut the corresponding plank for the opposite side to the same shape, and screw the two in place. Use carpenter's clamps to force the two planks into the cutouts in the stem. You are using lap-strake construction, therefore each successive plank will overlap that preceding by one inch, and at their ends make a tapering cut so that all planks finish up flush with each other. The second plank on the bottom will not require any shaping other than that necessary to fit it into the stem.

Always prepare two planks alike and fasten them on their respective sides before going on to the next pair. The third pair of planks on the bottom are not shaped before fastening on, but are planed flush with their chine pieces afterwards. In fastening the planking to the stem and transom be sure to leave V-seams for caulking.

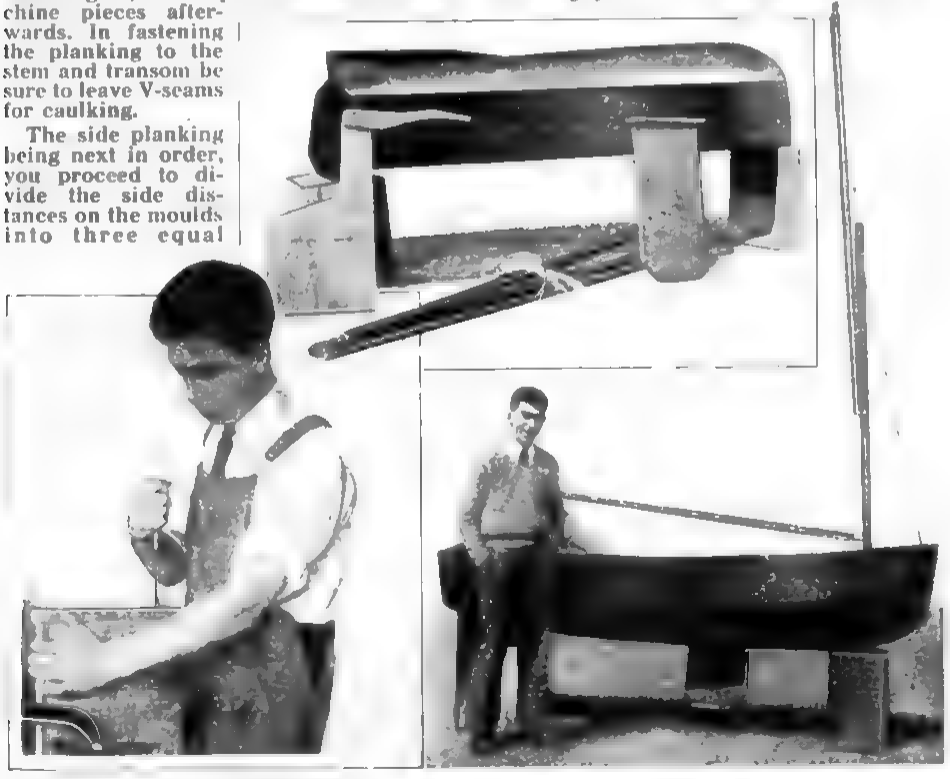
The side planking being next in order, you proceed to divide the side distances on the moulds into three equal parts. Then screw the first of the bottom planks to the chine, stem, and stern so that one edge is lined up with the first of the equal divisions on the mould. Plane off that part of the plank which extends past the bottom.

As in the case of the bottom, it is important to make duplicate planks and fasten one on each side before the next set is added. This equalizes strains and prevents the boat from being warped out of shape. Form the second side plank so that when it overlaps the first by one inch, its other edge will line up with the next division on the moulds. The last side plank is added in the same manner.

Centerboard and Sail

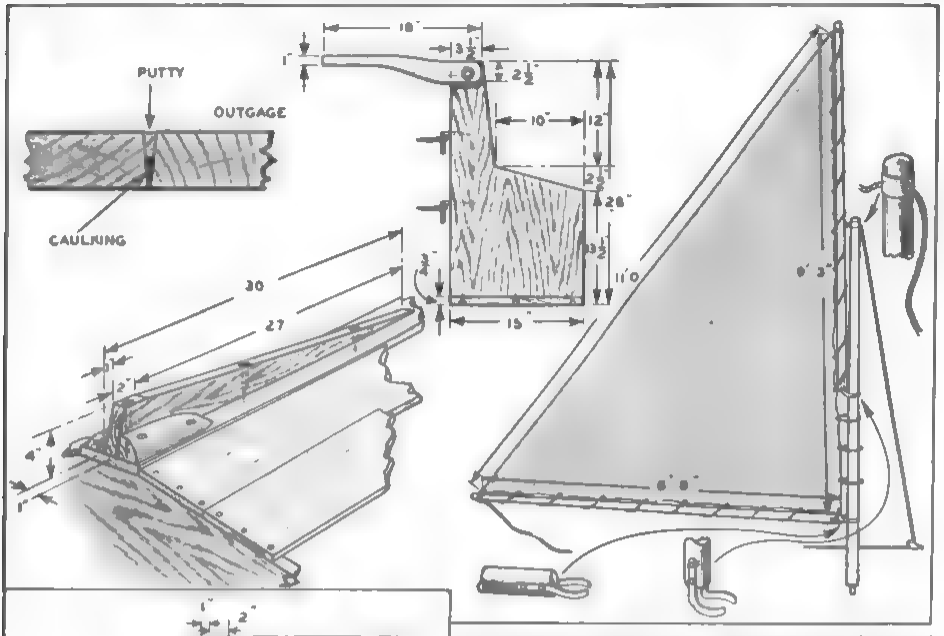
The planking now being finished, you are ready to turn your dinghy right side up, add the side ribs, clamp, skeg, seats, and floor. Screws started from the outside hold the side ribs in place, and the rowing thwart is to be put in before removing the moulds. Once these are out of the way you can easily add the remaining parts.

We have omitted any mention of the centerboard and sail in order to have perfectly clear the fundamentals of the hull itself. If the dinghy is not to be sailed these two

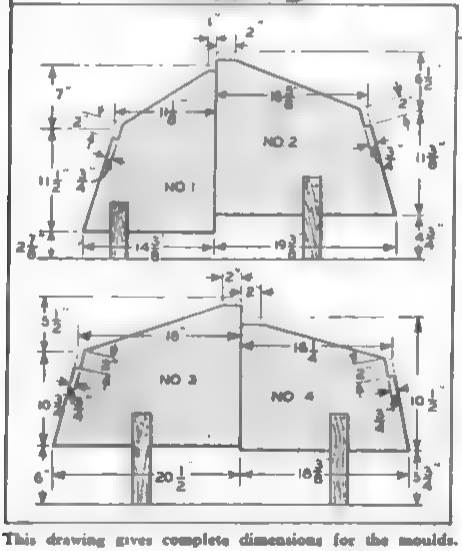


Two of these views show Tar Baby completed—one with her keel to the sky, showing under-construction; the other with her mast in place. Her designer stands alongside. At left above, Mr. Stewart putting finishing touches on tiller.

Sail Plan, Tiller and Mould Construction Are Shown in These Drawings



Sail and tiller details are clearly shown above. Mast, gaff, and boom are each 6 ft. 10 in. long. Sail is of 4-oz. twill or duck, sheet-rope and halyard are quarter-inch cotton line.



This drawing gives complete dimensions for the moulds.

features can be omitted, but by so doing you will miss the thrill of one of the greatest sports in the world.

No other thrill compares to that which comes to you as your sturdy little boat glides over the water without effort, and with only the whistle of the wind and the gentle murmur of the water at your bow to disturb your solitude. Or the hard-driven races, every gust of wind keeping you on your toes, the surge of the water near the gun'l as you heel her way over and kick white water into the face of the fellow behind. You'll never regret adding the sail!

The centerboard trunk is made of ¼" white pine with 1¼" square ends. Methods of construction are shown clearly on the drawing. With a centerboard installed you will find it necessary to hinge the rowing thwart so that it can be tilted out of the way when removing or raising the board.

The Mast Step

This method is much better than the usual one of having a slot through the thwart, as in the latter case water sometimes comes up through the trunk, with unpleasant results. The mast step consists of a socket in the stem and a hole through the forward seat. The mast, gaff, and boom are all just 6 ft. 10 in. long, consequently they can be stowed in the dinghy when not in use. The sail is made of four ounce twill or duck, and the sheet rope and halyard are quarter-inch cotton line.

When all the woodwork is finished you must sandpaper the hull until a very smooth surface is obtained. Then lightly drive a single thread of caulking cotton into each of the V-seams, and fill the remainder of the seam with marine glue, or any of the special elastic seam compositions made for the purpose.

Follow Directions for a Dry Boat

Do not use ordinary putty, as it will harden and drop out. *Do not caulk the lapped seams*, if you do so your boat will

SHOP BLUEPRINTS FOR "TAR BABY"

Workshop blueprints of Tar Baby are available for those who prefer to construct the boat from large size plans. They're genuine blueprints, made to withstand rough handling, made from the same drawings which illustrate this article, but about four times as large, making it easy to scale off dimensions. Tar Baby blueprints sell for $1.50, postpaid. Address Blueprint Department, Modern Mechanix and Inventions, 529 South Seventh Street, Minneapolis, Minn.

always leak, but if you leave them alone they will swell shut once the boat is in the water and will be very tight. When the seams are all finished paint the bottom and first plank on each side with a good grade of red copper bottom paint, and finish the remainder of the sides a gloss black. The inside should all be brown or buff.

Screw an eye-bolt into the stem, tie your tow rope to it, fasten rowlocks onto the sides, and *Tar Baby* is ready to launch. You and your kid brother can pick her up and carry her to the beach, or load her onto a wheelbarrow, the old Lizzie, or a trailer and take her yourself.

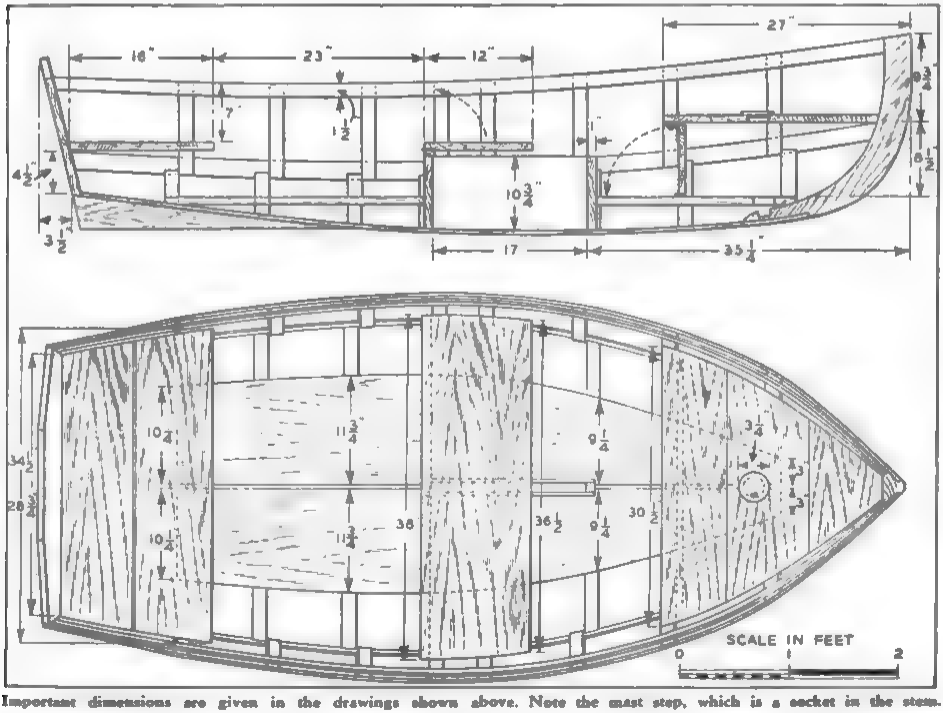
If you have never sailed before, you'd best make a little study of the art before trying your hand at it. It's not at all difficult if the few simple laws governing sailing are borne in mind. Most of the overturned sailing boats which every summer brings forth can be charged to rash or foolhardy handling.

An exhaustive article on the A-B-C of Small Boat Sailing appeared in the June issue of MODERN MECHANIX AND INVENTIONS, and this will be found to give all the essentials of the art. Books on sailing technique are available in all public libraries.

Tar Baby is about as simple a craft to sail as you could ask for, and she'll teach you all the tricks of sailing. Principles of sailing a five-masted schooner are the same as for *Tar Baby*—only the details are more complicated.

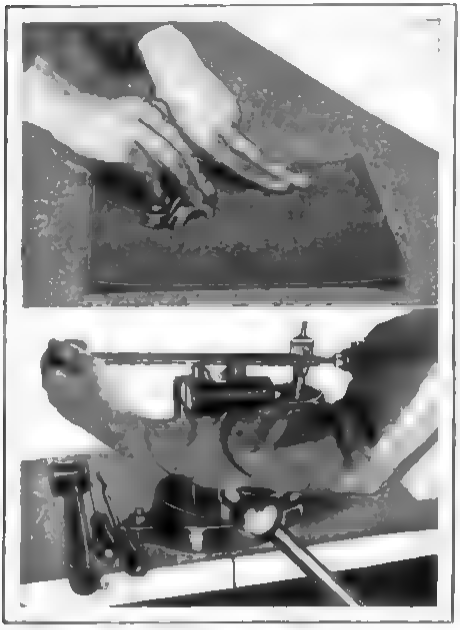
Remember that you can't be too careful in a boat. Know your rigging, your boat, and study the wind. Steer clear of anchored boats, moving ships, or anything else in the way of obstructions. You can't turn a boat out of the path of danger as swiftly as you could an automobile.

Don't fasten the main sheet securely when sailing. Keep it so it can be released instantly. Never put the boat's bow directly into the wind unless necessary. This will put the boat "in irons" (lose headway) and will cause a drift sternward that is often difficult to get control of.



Important dimensions are given in the drawings shown above. Note the mast step, which is a socket in the stem.

Reducing Bearing Caps When Taking Up on the Bearings



Here are illustrated two efficient methods of reducing bearing caps. Note method of holding file in photo below.

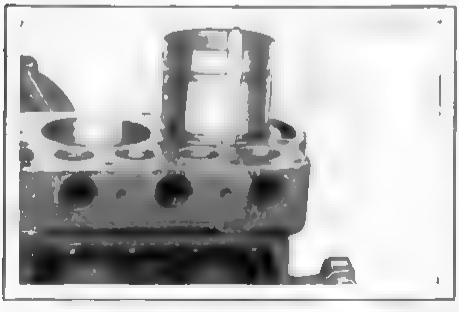
NOT all bearings are provided with shims for taking up the play occasioned by wear. These must be reduced by filing or grinding. The lower photo at the left shows the method of holding the cap and using the file when drawfiling to reduce the metal. Use an even stroke, and do not round the corners. Just a little filing is all that is necessary.

The top photo illustrates a more accurate method of reducing the cap. A piece of plate glass has a sheet of fine grain emery cloth placed on it. The workman holds the cloth with one hand, and grinds the bearing cap with the other. Use a rotating motion and turn the cap about frequently.

How to Test the Piston Fit

THE photo below illustrates a simple method of testing the fit of a piston to the cylinder by means of a feeler strip. Strips should be one thousandth inch thick for each inch diameter of the cylinder when fitting cast-iron pistons. Solid skirt aluminum pistons require twice this clearance. Split skirt aluminum pistons require .001 to .002" clearance, depending on the diameter of the cylinder.

By turning the piston and feeler in the cylinder, any out-of-roundness of the cylinder may be detected in an instant. A sharp eye and a pair of sensitive fingers will tell you that there are uneven spots in the round surface.

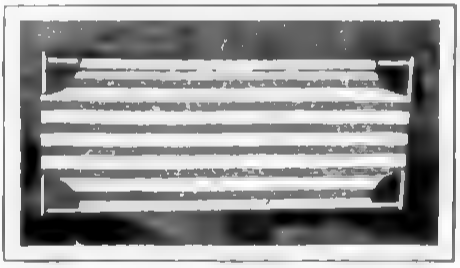


By turning the piston and the feeler strip in the cylinder, any out-of-roundness can be quickly and accurately detected.

Touch Up Spots to Stop Rust

IT IS a good plan to keep a small can of auto enamel of the proper shade on hand so as to be able to touch up any scratches or rust spots which may occur on the car body or about the fenders and chassis. Just as a "stitch in time saves nine" so a bit of paint placed on the newly developed rust spot or scratch will prevent serious damage to the metal parts from corrosion and eating away due to the ordinary contacts with weather and road slime.

A Child's Bed for the Sedan



Side pieces of the bed are made from old rake handles, ends from ½"x⅞"x24", cover from duck, beamed on sides.

MANY families like to use the sedan for sleeping quarters when on tour. The problem of caring for a child is rather easily met by making up the simple bed as illustrated above.

Select two rake or hoe handles of a proper length to just reach between the rear side windows of the sedan. Place these in position and measure and cut them to length. Next provide two end pieces. These should be about one and one-half inches wide, seven-eighths of an inch thick and twenty-two to twenty-four inches long or window-width length.

Bore three-quarter inch holes near the ends of these and fit the rake handles into the holes. Next sew up a cover from duck, putting a hem in each end and side. Cut out the corners and run a hem in them. Slip the handles and end pieces in position and the duck will hold the whole together.

SPARKS from the RADIO EDITOR

Edited by L. U. ROBBINS

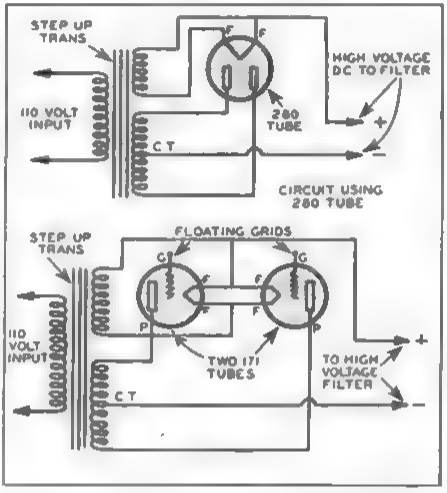
Emergency Substitute for Rectifier Tube

HERE is a stunt that may help the radio fan who has burned out his 280 rectifier tube and has to send away for a new one.

First, disconnect the leads to the 280 socket. Then near by, on a separate piece of board if necessary, arrange two UX or UV-sockets and connect their filaments in parallel. That is, connect A plus together and A minus together.

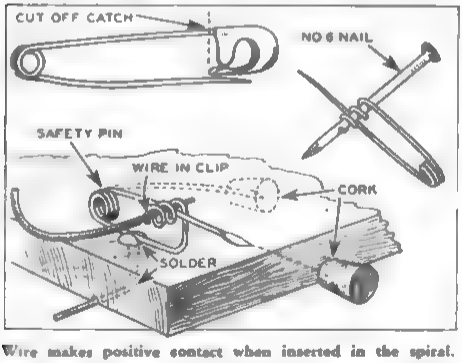
Then connect one of the 280 filament wires to the plus side of the two sockets and the other filament wire from the pack to the minus side. Now disconnect the power wires connecting the plates of the 280 and connect one to the plate terminal of one of the new sockets and the other to the plate terminal of the remaining socket. Disregard the grid terminals.

By using two 112 or 171 type tubes in the sockets you will get full wave rectification with sufficient current to operate a three or four tube receiver nicely.



Filaments of 271 tubes are connected as illustrated above, leads being run to 6l. transformer. Outer terminals of transformer then connect to plate terminals of each transformer.

Safety Pin Makes Clip Connector

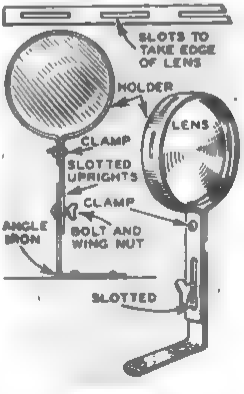


Wire makes positive contact when inserted in the spiral.

A SIMPLE, yet surprisingly efficient, connecting clip can be made from an ordinary large size safety pin as illustrated in the drawings above. The catch is cut off and the ends wound spiral shaped. If you want an insulated handle, flatten the end and force on a bottle stopper. To mount the clip solder it to the head of a brass screw, and attach wires in place by pressing down the cork and inserting the wires in the spiral. When the handle is released it will press against the wire with considerable force, making a rapid and positive contact.

Adjustable Television Lens Mount

SOMETIMES the lens in a television receiver does not stand at quite the right angle to give the best vision. Here is a simple method of mounting by which the height and angle can be altered. Make a long strap of stiff metal that will wrap completely around the edge of the lens and then bolt together as shown. In the long leg of the strap cut a slot about 2 inches long as shown. Then make an angle piece and cut a slot in the upright of that, then fasten the two pieces together. By this means the lens can be raised or swung from side to side. Tighten holder into best position with nut.



Adjust lens to best angle for vision by loosening wing nut.

Simple Companion Receiver

by **THORNTON HALLETT**

Last month's issue of Modern Mechanix presented plans for an efficient radiophone for talking around town to fellow radio fans. Now here are the plans for a receiver which picks up the 5-meter voice signals. With these two inexpensive outfits rigged up together you will have an ideal radiophone station that will introduce you to the keen thrills to be had from talking over the air.

THIS is a companion to the five-meter transmitter described in the last issue of MODERN MECHANIX AND INVENTIONS. Like the former, it was pu' together experimentally and therefore the layout need not be explicitly followed. It was constructed entirely of spare receiving parts and, exclusive of the tubes, should cost the builder very little.

Let it be understood that much work is still to be done on five meters and other types of receiver circuits can be used, but the super-regenerative appears to be the best for those frequencies.

Receiver Easy to Operate

Good tubes must be used. Some may not respond to these high frequencies but, by trying several, you will have no trouble to get the outfit working. It acts similar to the ordinary regenerative receiver with one exception. When looking for signals the noise level will be high. But when a signal is crossed the noise will die out and the signal come in clear and sharp.

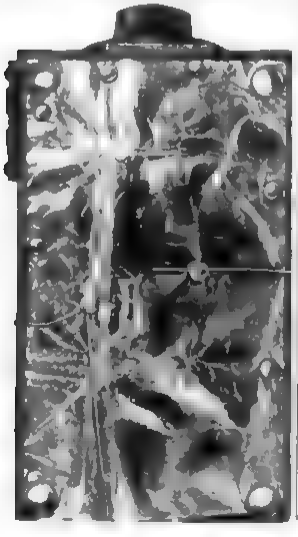
A good vernier dial *must* be used on the tuning dial and the tuning condenser also must be one with a quiet rotor connection. The resistors also should be extremely quiet in operation and for this reason IRC resistors were chosen for this particular job.

Arranging Parts on Baseboard

The baseboard used measured 7 inches across the front and was 12 inches deep. By looking at the baseboard layout diagram (Fig. 2) you will see how the various parts were assembled. Slight alterations of this assembly will have no serious effect on the receiver's operation.

First place the .0001 variable tuning condenser in the center of the front with space enough for the R. F. choke in front of it. A piece of rubber or cigarbox wood fastened upright to the baseboard edge will suffice to support the vernier dial.

At the left of the tuning condenser is placed a phone jack or phone tip jacks while at the right is fastened the antenna tuning condenser. This latter consists of



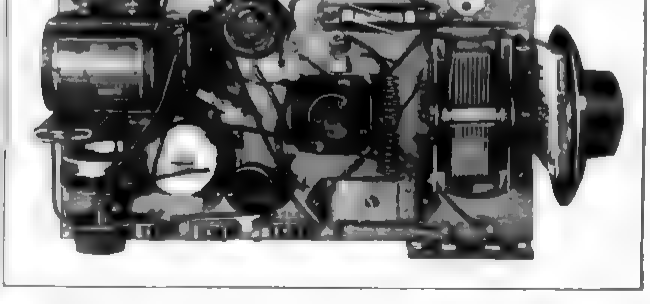


Fig. 1. Bottom of receiver is shielded with coating of tinfoil as shown at left. All grounds in circuit run with direct short leads to this foil. In top view of set, at right, is seen arrangement of parts. Study this in conjunction with drawing Fig. 2.

for a 5-Meter RADIOPHONE

Blueprints for Modern Mechanix 5-meter Radiophone Station

A set of large-size shop blueprints for complete radiophone station, including the 5-meter transmitter shown in the August issue, and the supplementary 5-meter receiver shown herewith, all made from original drawings, are available for $2.00 from the Blueprint Department of Modern Mechanix and Inventions, 529 So. 7th St., Minneapolis, Minn.

How to Become a Radio Amateur

This little 5-meter radiophone will initiate you into the radio amateur's world. However, you will encounter some difficulties, like mastering the code, learning radio fundamentals, and obtaining your government license. How to overcome these difficulties with greatest ease is told in a little booklet, "How to Become a Radio Amateur," available from Modern Mechanix for 25c.

two ½-inch square aluminum plates, with right angle base lugs, fastened parallel about 1/16 inch apart. A Fahnestock clip is connected to the outside one.

The three sockets are placed as shown in photo and diagram, the middle and left one being 4-prong affairs while the right socket is a five-prong or UY.

Just behind the tuning condenser and at the left is placed a midget condenser of about .00001 capacity. This can be a rotor type if handy but the writer used a book type balancing condenser with equally good results. It was taken from an old broadcast receiver. At the right of the base is placed a holder and a 2 meg. gridleak.

The auxiliary oscillator and audio system is at the rear end of the baseboard. This consists essentially of any good audio transformer, a 50,000 ohm variable resistor, preferably of the carbon type to avoid noise, the auxiliary oscillator coils, a 150,000 ohm resistor across the secondary of the audio transformer and the five fixed condensers shown.

Fahnestock clips can be placed at convenient points along the edge of the base for connections to A plus, B minus, B plus 90, B plus 45, B minus and Ground.

Now turn the receiver over and shield the bottom of the base board with heavy tinfoil as shown in the photograph (Fig. 1). This was done by shellacking the wood and foil one coat and then a second when the first was dry.

While the second coat is still tacky,

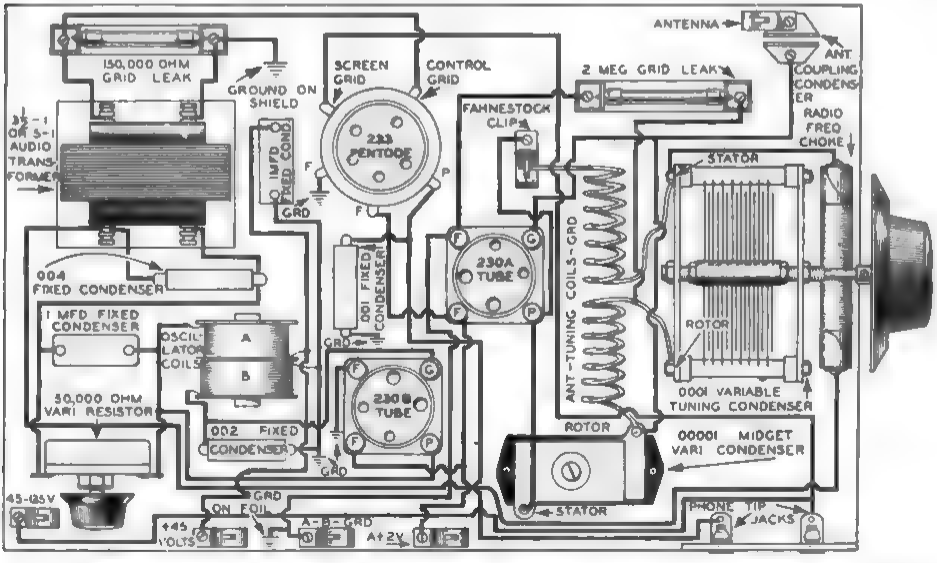


Fig. 2. Arrange parts on 7x12 in. baseboard and wire them up as illustrated. Leads ending in "grd" connect to foil on bottom. Tuning coils are supported by terminals of tuning condenser, which is in turn mounted on bakelite or hard rubber panel.

Fig. 3. Here is side view of the receiver, giving clear idea of arrangement of condensers, tubes, audio transformer, resistor, phone tip jacks, and Fahnestock clips.

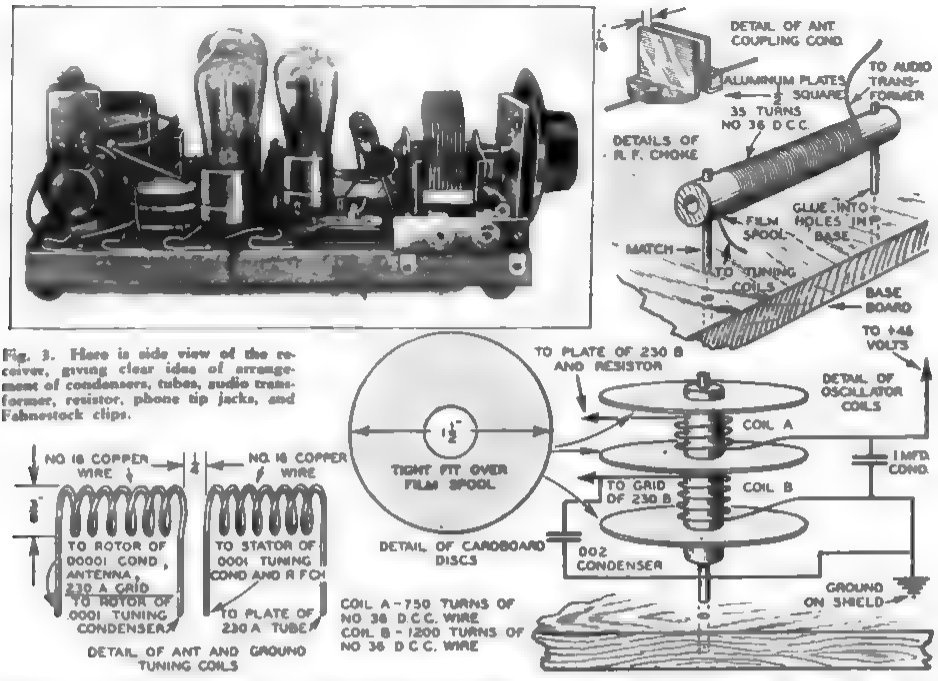


Fig. 4. Parts of receiver which can be made in workshop are shown here. Antenna condenser, seen at top, is simply two bent aluminum plates set close to each other. In details of oscillator coils, at right, coil B should have both terminal connections and winding direction reversed. Top terminal of B goes to .1 mfd. condenser, lower terminal to grid of 230 B tube.

spread the foil smoothly over the wood. A few thumbtacks will also help in preventing the corners from being turned down.

This shielding is represented in the diagram by the ground symbol. Be sure no screws, etc., project through the wood to touch the foil. Four rubber chair legs feet at the under corners of the base serve to keep the shielding clear of the table when the receiver is righted.

A thorough study of the wiring diagram (Fig. 5) will suffice to guide the builder without much additional instruction. However, be careful to make all grid leads as short as possible. In fact all wiring should be made direct and to the point using as little wire as necessary.

Use Extreme Care in Wiring

Solder all necessary joints carefully and use either insulated wire or bare wire and spaghetti. Run wires from the A minus, B minus and Ground clips directly through the baseboard and connect to the shield. This also applies to all grounds shown in the diagram.

If desired, a switch can be placed in the A minus lead between the clip and the shield for turning on and off the filament current. Wiring to the shield also applies to the negative leads from the tube sockets.

If necessary, the .0001 midget condenser can be dispensed with as it merely serves to center the tuning range on the dial of the tuning condenser. But it is handy and try and use one if possible.

Now as to the construction of the few special parts shown in Fig. 4. The R. F. choke can be easily made by using a wooden film spool or dowel of similar proportions. Drill a small hole through each end into which glue a match stick. Then wind on 35 turns of No. 30 DCC wire, binding the turns with Duco cement. The matches can then be glued into holes in the base directly in front of the tuning condenser and the choke thus held horizontal and rigid.

Winding the Tuning Coils

The tuning coils are also shown in Fig. 4. Wind them of bare copper wire stiff enough to be self supporting. Number 16 or 14 will do nicely. Wind on seven complete turns for each coil making them ¾ inch inside diameter and space the turns about the diameter of the wire.

They should be coupled about ⅛ inch apart behind the tuning condenser and connected as shown in Figs. 2 and 5. If the two coupled end leads can be fastened direct to the rotor and stator of the tuning condenser it will materially assist in holding the coils rigid. Rigidity is important.

The auxiliary oscillator coils may seem

to offer a problem but actually their construction is quite simple. Cut three disks of stiff cardboard 1½ inches in diameter as illustrated in Fig. 4. Cut holes in their centers to make a snug fit over a wood film spool and glue them in place on the spool ½ inch apart.

The spool can be about 1½ inch long. Drill a hole through the center of its length and glue in a small dowel projecting from the bottom about ½ inch. In the top section A, scramble wind 750 turns of No. 36 DCC wire, tagging the beginning and ending leads. Then wind 1200 turns of No. 36 DCC wire in section B, being careful to wind in the same direction and tag those ends as well.

How to Wire up Oscillator Coils

Flooding the windings with Duco cement will bind them close and they can then be covered with electrician's tape to cover them if desired. Drill a small hole for the dowel in the base and glue the dowel into it.

The detail sketch (Fig. 4) shows how to connect the coil leads. Be sure the finishing lead of coil A and the beginning lead of coil B are connected to the .1 MFD fixed condenser. This leaves the starting lead of A to go to the plate of tube 230 B and the finishing end of coil B will connect to the grid of tube 230 B. Other connections as indicated.

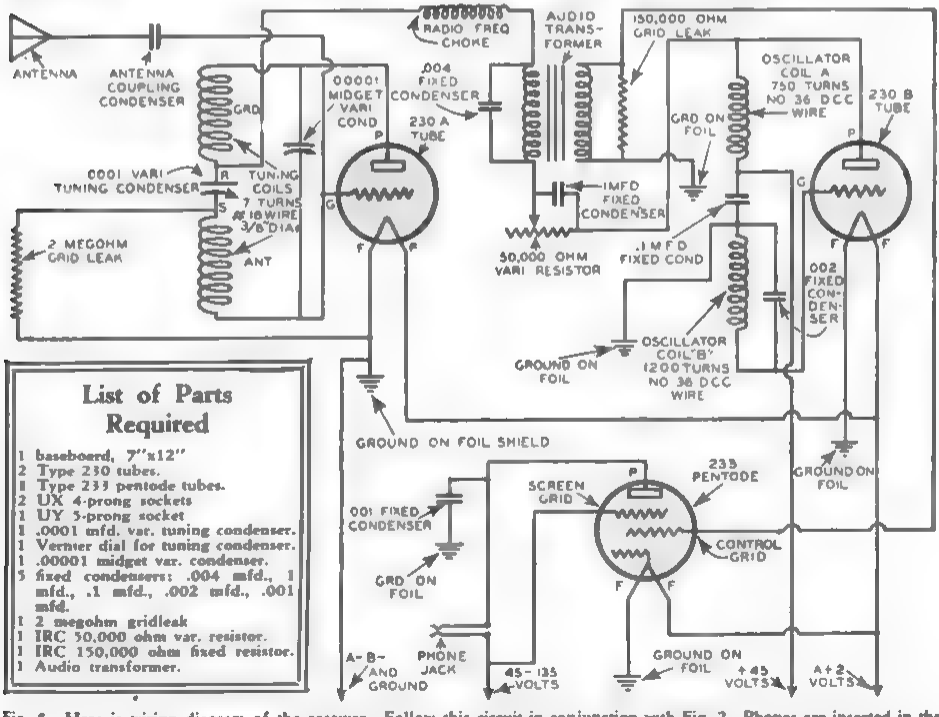
The use of a pentode tube in the audio stage calls for the same screen voltage as applied to the plate and please note that this is taken from the battery side of the phone jack to prevent this unnecessary drain from going through the phones. Type 230 tubes are used for the detector and oscillator while the 233 pentode is used in the audio end. This allows the receiver to be operated from a single storage battery cell or from two dry cells with a suitable resistor to drop the potential to 2 volts.

When using such a dropping resistor always be sure to measure the voltage with a suitable voltmeter *at the tube terminals* and do not allow the voltage to run at more than 2.2. Higher voltage is detrimental to the filaments of these tubes.

Or, if you desire to operate direct from a 6 volt source you can insert a 230 Amperite in the A minus lead of each 230 tube and two 232 Amperites in parallel with the A minus lead to the 233 tube. This latter stunt is necessary to pass the current drain to the 233 which is in the order of 26 mils.

This arrangement will allow the receiver to be operated direct from a car battery for field experimental work. Due to the low plate voltages used it has been found that biasing is not necessary and the signal quality is good enough without it.

(Continued on page 152)



List of Parts Required

1 baseboard, 7"x12"
2 Type 230 tubes.
1 Type 233 pentode tubes.
2 UX 4-prong sockets
1 UY 5-prong socket
1 .0001 mfd. var. tuning condenser.
1 Vernier dial for tuning condenser.
1 .00001 midget var. condenser.
5 fixed condensers: .004 mfd., 1 mfd., .1 mfd., .002 mfd., .001 mfd.
1 2 megohm gridleak
1 IRC 50,000 ohm var. resistor.
1 IRC 150,000 ohm fixed resistor.
1 Audio transformer.

Fig. 5. Here is wiring diagram of the receiver. Follow this circuit in conjunction with Fig. 2. Phones are inserted in the jacks, seen in lower part of drawing, while tuning is done with the .0001 var. condenser. Make all leads short as possible.

Fold-up Pole Gives Speed and Handiness on Fishing Trip

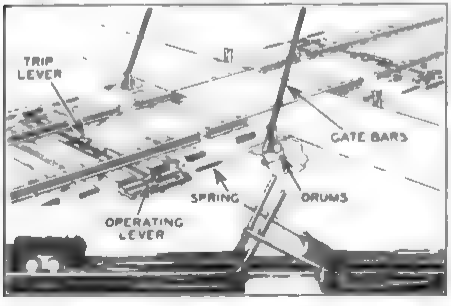
Speed and handiness in getting under way is provided with folding fishing rod, shown in photo above, having hinged joints, each with a threaded sleeve that fits over the hinges.

FISHING addicts will welcome the news that there has recently been invented a fishing pole which offers the utmost in convenience. What sets this pole off from all others on the market is its fold-up qualities, which permits the utmost dispatch and handiness in getting set for an attack upon the finny tribes.

The pole, shown in the photo at the left, has the usual three sections of the usual length and sturdiness, but the joints are hinged together, each joint having a threaded sleeve that slips over the hinges. When out of use the joints fold together in an inseparable whole, so that there is little danger from loss of the parts.

Trip Lever Closes Safety Gate

THE long felt need for a sure-fire crossing gate that will automatically lower itself when a train approaches, and perform the feat with a minimum of mechanical complication, is filled in the development of a new gate, shown below, which makes use of only a set of tripping levers. When a train approaches, it operates the trip lever, which releases a spring as illustrated below. When this occurs, a chain passing over the drum lowers the bars.



Safety gate across road is closed when approaching train trips lever. Similar lever on other side opens gate again.

Flashlight Has Movable Head

ESPECIALLY suitable for use by auto mechanics, electricians, plumbers, etc., who often need both hands free while at work, a new flashlight now on the market has a movable head which makes it possible to direct the light just where you need it. The current is carried by two side arms in the jointed head above, thus retaining a perfect light in any position. The lens is the universal focus type, producing a clear white light without shadow rings. Device can also be used in same manner as ordinary light.

Movable head on this flashlight may be swung to any angle, as shown. Current to light is carried in side arms

What Are Dark Spots on Mars?

DR. E. M. ANTONIADI of the Meudon Astronomical Observatory, near Paris, who is recognized as an authority on the planet Mars, believes that he once glimpsed on that planet, twenty-three years ago, a remarkable landscape of what seemed to be forests and meadows studded with mysterious white dots.

Turning the instrument toward Mars and focussing on one of the dark areas or "seas" just south of the marking which astronomers call the Syrtis Major, Dr. Antoniadi saw what looked like a broad, plant-covered plain with some parts slightly darker than others, as though these were patches of forests surrounded by cleared areas covered with smaller plants.

Amateur Electrician

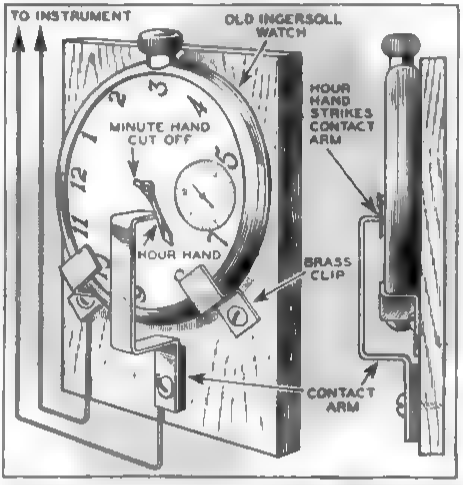
Edited by SEWELL LEHMAN

Automatic Time Switch from Old Watch

IF YOU can lay hands on an old dollar Ingersoll watch that still manages to tick, it will be a simple and inexpensive task to rig up an automatic time switch that will close the circuit at any desired hour. As a case in point, it will turn on parking lights of your car when built onto the dashboard.

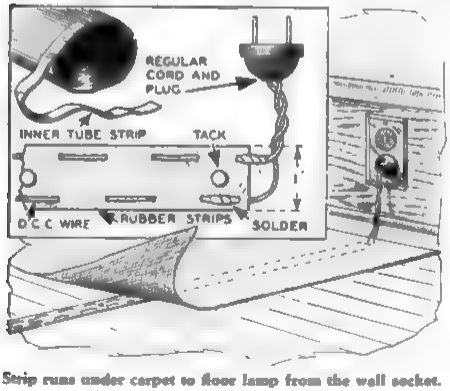
In constructing the switch, first remove the crystal, then cut off the minute hand of the watch. The next task is to make the mounting. For a backboard, you will need a small piece of wood, or, better yet, a square of hard rubber. Now on this backboard mount the two brass clips in such a position that they will hold the watch firm. Then add the contact arm as shown.

Wire up the switch by running one wire to the contact arm and another to one of the brass clips. Then connect the wires in series with the battery line leading to the light or motor to be turned on. Set the switch to the desired hour by turning the hour hand around to noon, and then setting the watch in such a position that the hand will strike the contact arm when the hour arrives.



Clips hold the watch to backboard while collision of hour hand with contact arm closes the circuit at desired hour.

Wires Threaded in Rubber Strip Make Flat Lead to Run Under Carpet

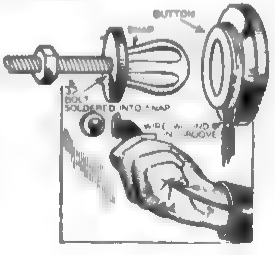


Strip runs under carpet to floor lamp from the wall socket.

RUNNING a wire under a carpet to a floor lamp, radio, or fan, presents a tough problem sometimes, but here's a way to arrange the wires so that they will be out of the way and out of sight. Procure an old inner tube and cut from it a strip of about the length needed. Now cut in this strip a row of small holes on each side as illustrated in the accompanying drawing. Through these holes weave two lengths of heavily insulated wire, bringing out the leads at the end and soldering them to a section of lamp cord, which runs to the 110-volt bayonet plug. Lay the rubber strip under the carpet, and tack down the former so that it will be slide-proof. The free end of the wires then connect to the floor lamp or what have you.

Efficient Panel Connectors From Old Glove Snaps

NEED some handy little connectors for your radio or electrical control board? A couple of snaps from an old pair of gloves will come in handy. Into the snaps solder small sections of 6/32-in. bolts, as illustrated, and secure the part to the panel. Now, for the connectors, wind the lead wire around the groove in the button, binding the wire as tight as possible for a good connection. When you want a connection simply press the button onto the snap.



Perform These Spectacular

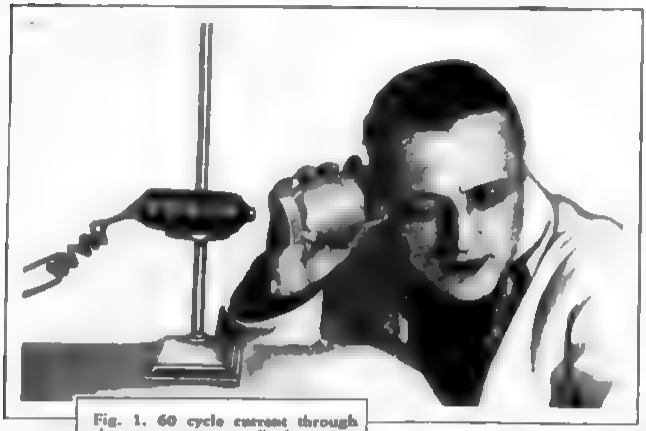


Fig. 1. 60 cycle current through the magnet causes diaphragm to generate 60 cycle hum in earpiece.

Electricity has strange ways of doing stranger things, and the best way to prove it is to perform these spectacular, though extremely simple tricks. If you want to study electrical phenomena, the stunts will prove highly instructive; if you want to astound friends, they'll prove unusually mystifying. Parts needed can be found in your workshop.

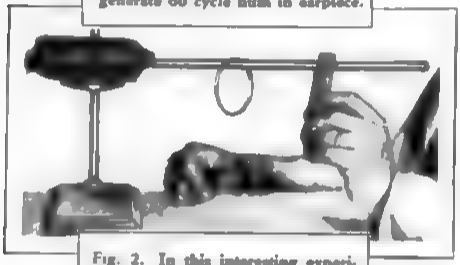


Fig. 2. In this interesting experiment, magnet drives aluminum ring along iron rod. Figure out why.

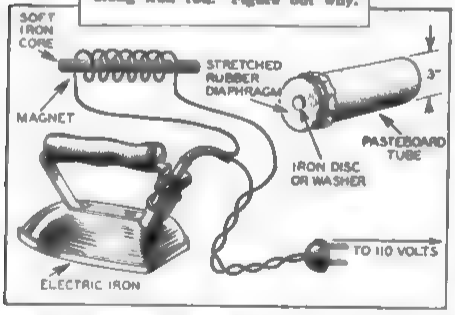


Fig. 3. It's advisable to hook a flat iron element in series with the magnet, as illustrated above. Also shown is method of constructing the earpiece for listening to A. C.

SOME interesting experiments and a few spectacular ones can be carried on by those interested in electrical phenomena. They make interesting stunts to pull off at a party, or even in actually demonstrating what both alternating current and direct current will do. The apparatus required is both simple and inexpensive and can be found about the average workshop.

The things needed include a suitable stand such as a laboratory standard, an electric flatiron (sunbowl heater can be used if more available), a heavy duty electro magnet, flashlight bulb and socket, a ring of aluminum wire, pair of radio headphones, any good honeycomb coil or equivalent, a large mailing tube, sheet of thin rubber, iron washer, storage battery, Ford spark coil, some wire and strips of sheet brass. The experiments are all harmless and easy to carry out.

Fig. 1 illustrates how one can listen to alternating current. This can be done with either 60 cycle or 25 cycle current. First, disconnect one lead of the flat-iron or sunbowl cord and wire the resistance in series with the magnet.

Connect the resistance (iron or bowl) in series with the magnet and place the latter on the stand as shown in Fig. 3. Now stretch the sheet of rubber over one open end of the mailing tube and glue the iron washer to the center of this diaphragm.

Plug in the cord and energize the magnet. You can prove magnetization by holding a piece of iron or steel near the magnet. It should be strongly attracted to the core.

Diaphragm Sounds Out 60 Cycle Hum

Now hold the open end of the tube to the ear and bring the washer on the diaphragm near the magnet core. The alternating current hum will be loudly picked up as the washer is moved nearer and nearer to the magnet core. A 25 cycle hum will be especially loud and discernible.

You can prove induction in another interesting way as illustrated in Fig. 5. Screw the flashlamp bulb into a socket and connect the terminals to the leads of the honeycomb coil.

With the magnet energized, hold the coil in the hand and bring it gradually close to the magnet. The lamp will be seen to glow and increase in intensity as the coil is brought up to the turns of the magnet. Be

Stunts With ELECTRICITY

careful lest you burn the lamp out with too strong a magnet operating.

How many of you have ever tried to photograph an electric spark? Well, here is a fine way to do it, and if done carefully you can procure a fine negative that will astound your friends.

First spread out a sheet of tinfoil on the table and lay a photographic plate, emulsion side up, in the center as demonstrated in Figs. 9 and 10. This must be done in a dark room under a ruby light. Then connect a 6 volt storage battery to the terminals of the spark coil as shown.

Disconnect one battery wire while assembling the secondary circuit. Then run a wire from the front terminal to the tinfoil and connect a wire from the rear top terminal to a small screwdriver or awl. Sprinkle talcum powder entirely over the plate allowing it to cover also a bit of the tinfoil.

Photo Shows Zig-Zagging Spark

Hold the pointer or screwdriver handle in the hand and then connect the battery circuit. The vibrator of the coil should buzz evenly. Carefully, keeping the hands away from the tinfoil and the metal of the pointer, bring the end of the pointer near the center of the plate. When within about ¼ inch or so a spark will jump to the talc, thus closing the coil secondary circuit.

Let this spark continue for only a second or so. Then develop the plate and you will find a fine picture of the spark, black against a white ground. When printed all the various branches of the electric spark will be seen. See Fig. 9 for the hookup.

While you have the spark coil handy here is a stunt that will mystify as well as please. This is shown in Figs. 7 and 8. Screw a 5 watt (2 CP) bulb into a standard socket. Then connect one terminal to the front top terminal on the coil. Leave the other socket terminal open. Fasten a vertical rod or stiff wire to the rear top on the spark coil.

Close the battery circuit and when the coil is buzzing grasp the vertical rod with one hand. Press the tips of the fingers of the other hand on the bulb and a blue glow will flow from the lamp filament to them, easily seen in a darkened room. No shock or other effect will be felt.

A similar effect can be obtained with an

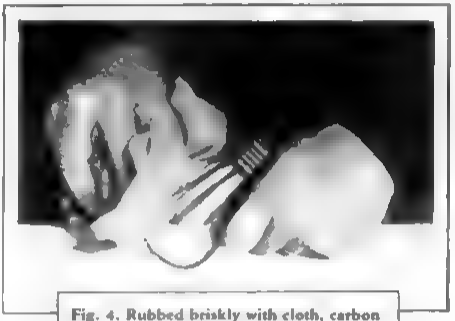


Fig. 4. Rubbed briskly with cloth, carbon filament lamp will glow in weird manner.

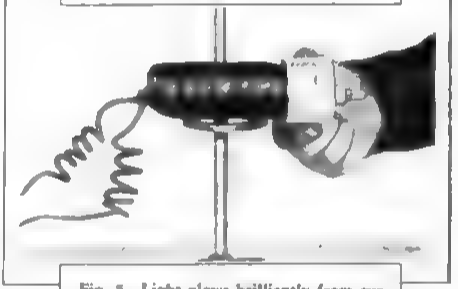
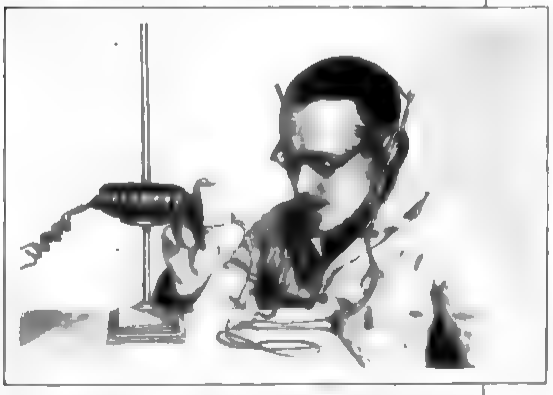


Fig. 5. Light glows brilliantly from current induced in the honeycomb coil.



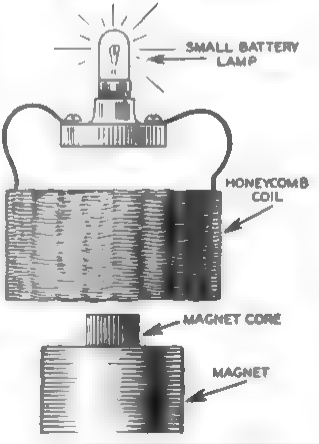


Fig. 6. 60-cycle A.C. is heard in phones from induced current in coil. At right is seen hook-up of honeycomb coil.

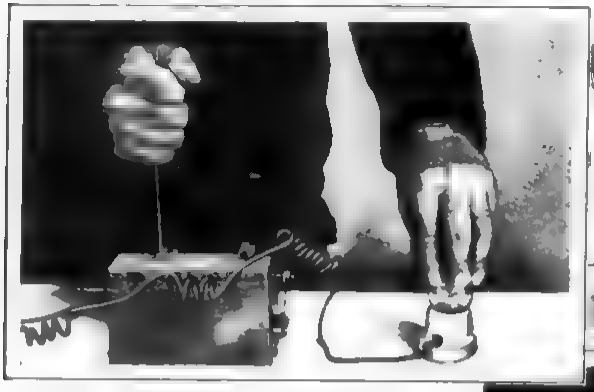


Fig. 7. When one hand is held on metal rod, and other on bulb, sparks are seen issuing from finger tips in a weird display.

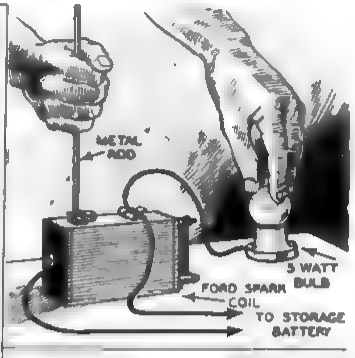


Fig. 8. Top, right. Wire up the spark coil to the light socket terminal as illustrated in the drawing.

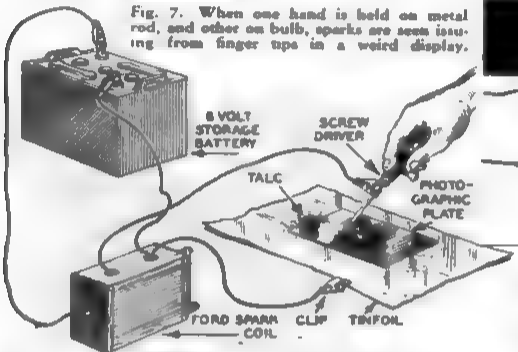


Fig. 9. To make startling photograph of spark, wire up the apparatus as in above drawing. Layer of talcum powder completely covers the photographic plate in experiment.

Fig. 10. Below. Spark photo is made by bringing end of screwdriver near center of photo plate. Let spark jump for second or so, then develop film in darkroom. When printed all various branches of the electric spark will be seen.

ordinary carbon filament lamp as shown in Fig. 4. Hold the lamp in one hand and with the other rub the glass briskly with a dry cloth. A blue glow will fill the bulb and, if carried to an extreme, the filament will even separate and cling to each side of the glass.

Now let's go back to the magnet. Connect a pair of headphones as in Fig. 6, connecting the phone cord tips to the honeycomb coil instead of the flashlight lamp. With the phones over the ears, bring the coil up to the magnet and the AC pulsations will be heard very loud.

Try AC Hum on Your Loud Speaker

A better demonstration is to connect the coil terminals to the input of a radio amplifier and use a dynamic speaker from the amplifier. The AC hum will fill the room.

A peculiar stunt showing the heating effect of magnetization on aluminum is shown in Fig. 2. Get an iron bar about a foot long. Supply a holder for the outer end and press the other end to the magnet core. Make a ring about 2 inches in diameter of aluminum wire and place on the magnet near the core end.

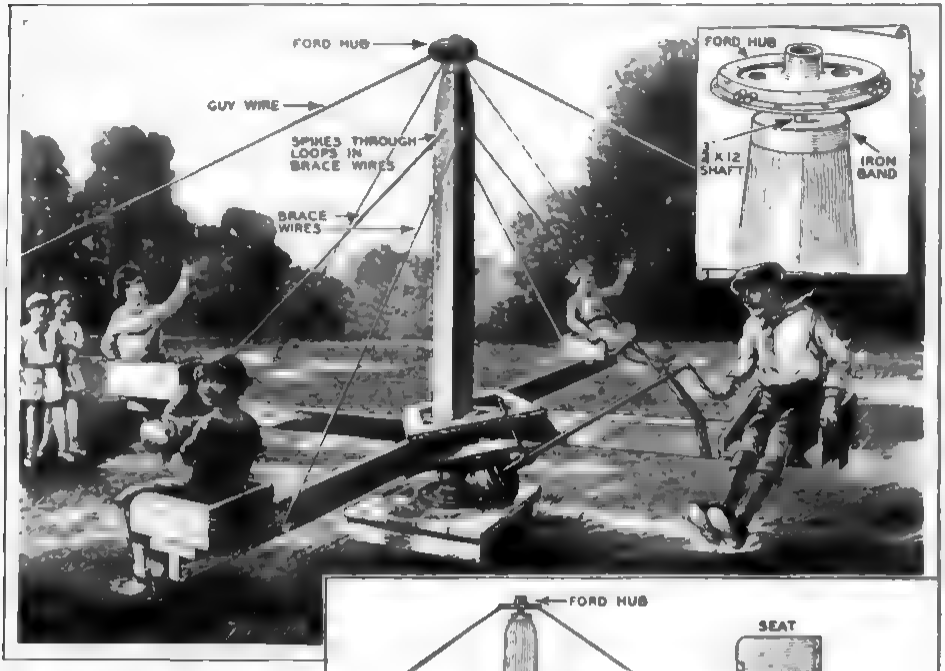
Plug in the circuit and watch the results. The magnet will repel the ring driving it along the rod the length of the magnet's field. If the ring is allowed to stay on the rod a short time it will become decidedly heated.

Here is an interesting experiment with about 15 volts of battery and some brass strips. Connect each battery wire to a strip of brass about 3 in. long. Immerse these in a solution of strong salt water keeping them an inch or two apart. The container must not be metal. The voltage used, the saltiness of the water and the quality of the brass will discolor the solution so a pigment deposited in a few moments will vary from blue, yellow, orange, green or brown. It is highly interesting to see just what effects of coloring can be obtained.

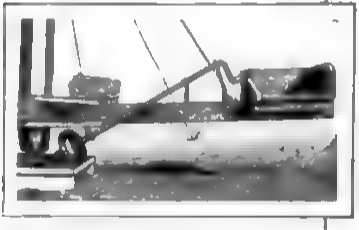
Making the Electromagnet

The magnet used in the experiments is nothing complicated. It can be about any size you wish, but as a suggestion wind approximately 500 turns of No. 30 single cotton covered wire on a soft iron core. This latter part can be a bundle of wires of soft iron, or a layer of strips ½ in. wide and about 5 in. long cut from old stove pipes. Electrician's tape should be wound around the core, between the layers of wire, and finally around the completed magnet. As to the honeycomb coil, you can procure it at any radio shop handling old parts.

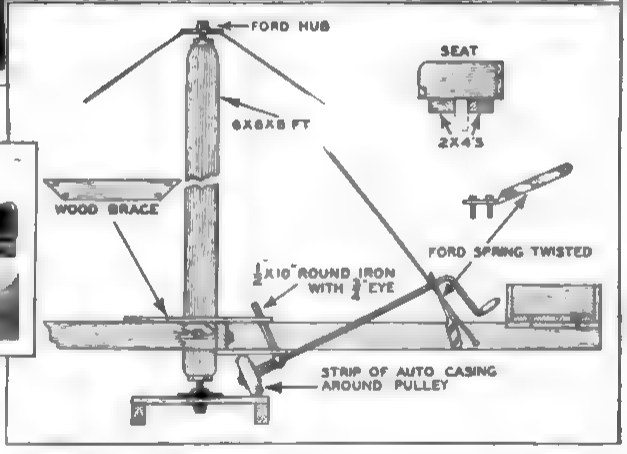
A Hand-Power Merry-Go-Round for Kids



One boy-power is sufficient to drive this novel children's merry-go-round.



Above photo shows the driving unit; at right, construction details. Brace wires are looped at either end and are held by spikes inserted in loops.



HERE'S an excellent little four-place merry-go-round, driven by hand, which will give endless pleasure to youngsters—and to grown-ups too, for that matter.

The drawings are so complete that little need be added, except a description of how to prepare the Ford hub bearings. Wrap two layers of paper, the thickness of this page, around one end of the ¾x12-inch shaft and glue down the end. Close the outer end of hub with a sheet iron disk, peened in. Place a ⅜-inch round plug ¾ inch long upright in bottom of hub.

Now insert papered end of shaft, centering with two thin wooden plugs, and pour babbitt or old car battery metal. Be sure grease is entirely removed from hub before pouring. When cool, remove shaft, paper, and the two centering wedges, these latter leaving two oil ways. Do not pour bottom bearing quite full, and you will have an oil reservoir.

The top bearing is made in the same manner, except that a hole is punched through the sheet iron disk, driving out the wood plug and leaving an oil hole.

Place cross arms so the bottoms will be 8½ inches above top of base. The driving crankshaft and bearings are clearly shown. You may require a little aid from a blacksmith on these, although they are quite simple. Use care in mounting the crankshaft so that the friction pulley does not grind.—Earl M. Dorris.

Build This Combination Belt

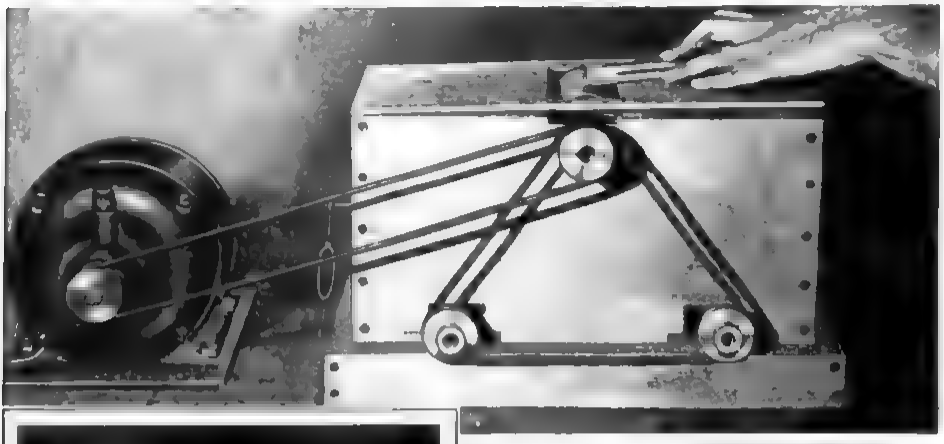


Fig. 1. Babbitt bearings are mounted in notches cut in sides of the box as shown here. A metal plate holds bearing in place. Adjusting screw regulates cut depth.

Fig. 2. Here is the drum sander in action. Note how top is raised for shallow cut. Three-cornered belt system delivers power equally to each pulley, giving positive action.

Fig. 3. Babbitt bearing is made as shown here. ½ inch thick blocks are nailed to board forming mold 1 inch square. In center is drilled ½ inch hole in which steel shafting is inserted. Babbitt is then poured in around shaft.

A POWER-DRIVEN sander of moderate size is one of the most useful machines that the owner of a home workshop can employ. But when you begin collecting information on available sanders, you soon learn that they are either one of two types—belt or drum.

A belt sander, useful for smoothing plane surfaces, squaring small pieces, etc., has its particular sphere of usefulness. The drum-type of sander resembles a jointer or planer in its action, and therefore is fitted for certain jobs that the belt machine cannot do well.

Sander Does Any Kind of Job

By incorporating the belt and drum actions into one machine, you can produce for your shop a sander that will do almost any kind of work. The one described here is easy to build and can be operated with a ⅛-horsepower motor.

The sanding machine consists of a base upon which is mounted a box-like frame containing the moving parts. This box is reversible, so that either of two surfaces can be placed in the top position. One side is used for drum sanding and the other for belt work.

Construct the base and box of 1-in. wood stock. Dimensions are as follows: Two side pieces, 7⅝x14½ in.; two ends, 7⅝x4¼ in. Simple butt joints with the sides overlapping are used, and are held together with screws.

In the center of each end of the box, drill a hole to receive a ¼-in. bolt. This bolt projects an inch beyond the outside surface and forms an anchorage for one end of a small turnbuckle, as illustrated in Fig. 6. The other eye of the turnbuckle slips over a similar projecting bolt in the end of the base. Thus the box can be locked

and Drum Power SANDER

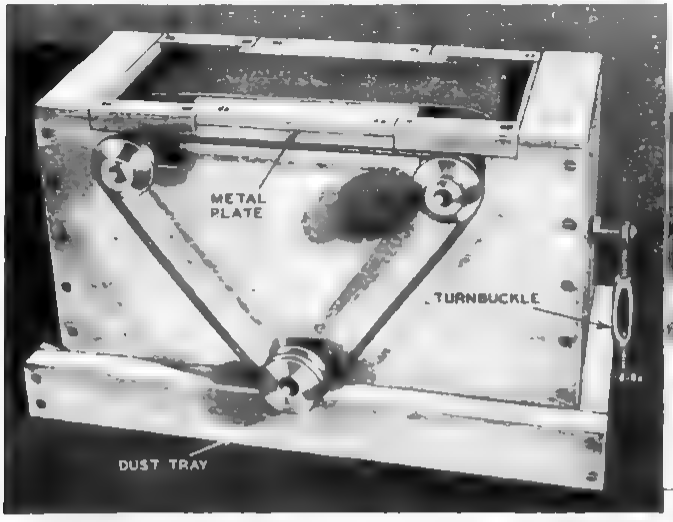


Fig. 4. To use as belt sander, turn box upside down, anchoring it firmly with turnbuckles, as illustrated. In placing end guards, leave enough room for rollers and belt to clear the edges. Metal plate forms solid base for belt.

in either of two positions by means of the turnbuckles.

The base consists of a frame 2 in. high and of an inside size that will receive the box. Around the inside is a ledge ½ in. wide and ½ in. below the top, to support the box. Thus there is provided beneath the sander a shallow tray that receives much of the sanding dust.

This machine uses a sanding belt that is obtainable ready-made. Three drums support the belt.

Drums Made From Maple or Birch

You can construct these drums from maple or birch pieces glued together and turned to shape on a lathe. First prepare three piles of wood pieces not less than 2¼ in. in diameter. Turning will be easier if you cut the discs roughly to shape on a band or jig saw. If you use ⅞-in. stock, you will need five discs for each roller. Glue them together with grain crossing, to prevent splitting, as illustrated in Fig. 5.

A large C clamp is suitable for holding the glued-up pile until the glue has set. Place the blanks in a lathe and turn out drums 4 in. long and 2 in. in diameter. Then through the center of each bore a ½-in. hole, preferably with a drill press.

Use ½" Steel Shafting

Through this hole drive a 7-in. section of ½-in. steel shafting. Then drill a hole through the drum and the shaft for a locking pin, and plug the hole with wood after the pin is in place.

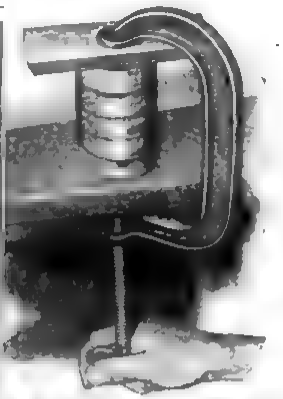


Fig. 5. The five wood discs, 2¼ in diameter, cut from ⅞ in. stock, are glued together with grain crossing.

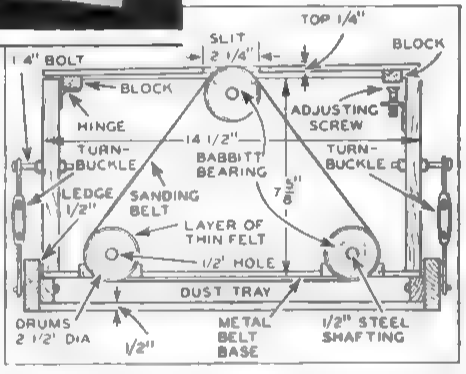


Fig. 6. Section view of the sander above illustrates clearly arrangement of the three drums. Box is held down with two turnbuckles. Note how adjusting screw supports top.

Finally, cover each drum with a layer of thin felt, rubber or other soft material that will provide a resilient surface.

You can make the bearings in any of several ways. One method is to cast 1-in. square blocks of babbitt about a section of shaft, as shown in Fig. 3. Each block is about ½-in. thick.

Make the mold by nailing ½-in. thick pieces of wood to a board, so that a square 1 in. on a side is formed. In the center drill a ½-in. hole. Into this insert a section of the shafting, the surface of which has been well oiled.

Making the Babbitt Bearings

Pour the molten bearing metal about the shaft, and as soon as it has hardened, but before it has cooled, remove the shaft with pliers.

(Continued on page 152)

Shallow DRAFT Side-wheeler

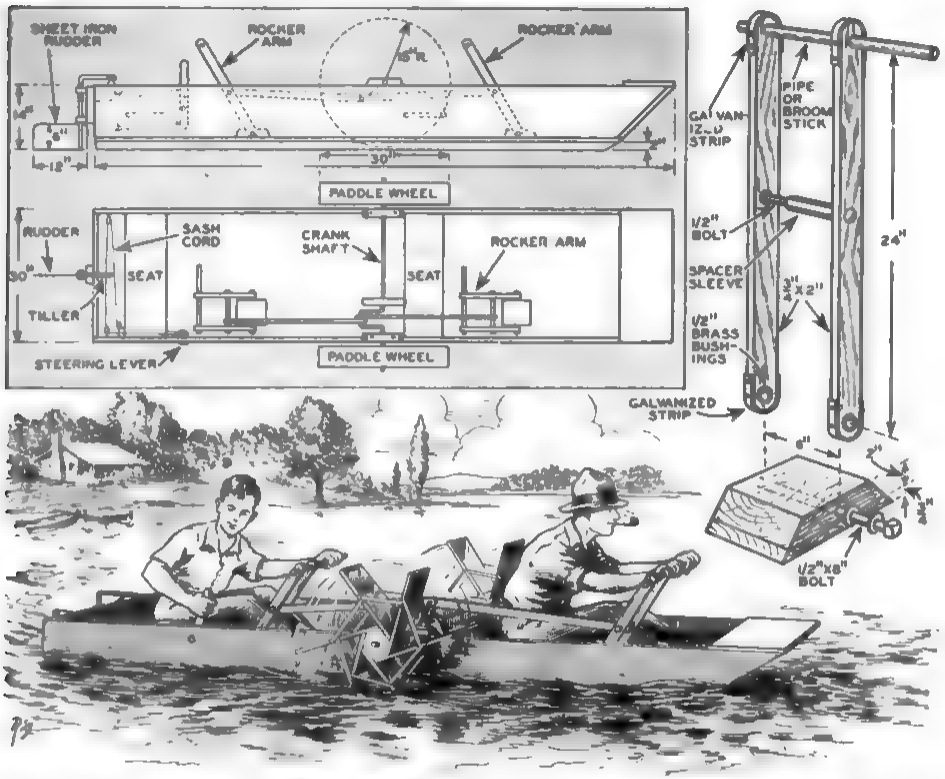


Fig. 1. In drawing at top are seen general dimensions of boat. Overall length, omitted, is 11 feet. In constructing rocker arm, if you want long strokes set cross piece for driving bar below middle point; if short strokes, set above the middle point.

HERE is a sturdy fisherman's craft which will navigate shallow, weedy bayous and streams with a minimum of effort and can be operated miles from a repair shop or filling station. It is designed for one or two man-power and is admirably adapted to casting, trolling and still fishing, as the passenger can propel or steer the boat without leaving his seat at the stern.

Trying to fish and handle oars among the reeds and spatter-docks is an awkward job, and the paddle wheeler permits easy maneuvering forward or back.

Hull Built From ¾" Pine

The scow is of the simplest construction compatible with a satisfactory job. General dimensions are given in Fig. 1. The width and length can be increased if your individual requirements demand, but 11 feet is found about right.

Three-quarter inch pine or similar material is used for sides, bottom and ends of scow. Half-inch material can be used if you wish to lighten the job considerably. Three ten-inch widths are used on the bottom, the seams covered with battens screwed or riveted in place, and held together with six cross frames as shown in Fig. 2. Use brass screws and copper rivets throughout.

Details of Crankshaft and Bearings

The cross-section amidships, shown also in Fig. 2, illustrates details of construction. Note that edges of bottom and side boards are slightly tapered to form a V-shaped seam which is to be caulked with cotton and white lead.

The crankshaft is made from ⅝-in. round iron or cold-rolled shafting and has a six-inch throw. This is a job for a blacksmith unless you have a forge of your own, as it will be necessary to heat the shaft before bending the crank.

Bearings are 2½-inch lengths of brass or bronze tubing driven to a tight fit in wooden blocks. Be sure the inboard bearing is carefully aligned. It can be secured to the bottom of the scow only after the shaft is inserted. Outer bearings on the gunwales are located and screwed down

for Fishing in WEEDY Waters

with the crankshaft in place. Drill ⅛-in. oil holes in each bearing.

Rocker-arms, or handle-bar frames are shown in Fig. 1. These consist of two parallel pieces ¾ in. by 2 in. by 24 in. between centers, i. e., handle and lower bearing, and spaced 6 in. apart.

Short lengths of brass tubing are driven into lower ends for bearings, working on a ½-in. bolt through a block secured to the bottom of the scow. A broomstick or section of pipe serves as the handle at the upper end, and ends of both parallels are bound with a strip of galvanized iron to prevent splitting.

Want Short or Long Strokes?

About midway between the ends a ½-in. bolt is located to carry one end of the driving bar. Location of this bolt should be determined by experiment to suit the individual user. If a long stroke is desired, locate the cross bolt below the midway point; if a short stroke, above it.

A short section of pipe serves as a spacing sleeve on this bolt. Note that the rocker arms are set on one side of the scow so as to make ample room for passage on the right.

Making the driving bar (Fig. 2) of hardwood. The crankshaft bearing is split bronze or babbitt, with a strap-iron holding it to the end of the bar. Short pins are set both in the wood and strap-iron to prevent bearing working out sideways, and brass shims are provided to keep it tight.

The split bearing is necessary in order to assemble it on the solid crankshaft. On the other end of the driving bar the usual short length of brass tubing is driven in for a bearing, and should also be provided with an oil hole.

The rudder is operated by a wooden lever screwed to the side of the scow beside the stern seat. It is connected to the tiller with sash cord through pulleys or screw-eye guides. A coil tension spring can be inserted to keep the tiller cable taut.

The rudder is simply a piece of heavy sheet iron 6 in. by 12 in. or a board bolted to a ½-in. round iron post bent at right angles to form the tiller, and carried in ordinary bearing or even large screweyes.

An extremely simple type of paddle wheel is shown in Fig. 6. This consists of six boards nailed to a solid hexagonal hub, with a series of light braces from blade to blade. The hub is cut from a 7-in. square block 5 in. long, and bored for the ⅝-in. shaft.

Paddle Wheel Removable for Repair

The outer end of the hub is slotted about ⅜ in. deep to receive a ¼-in. pin through the end of the shaft to serve as a key. A cotter pin and washer on the shaft near the gunwale prevents hub moving endwise. This arrangement permits removing the paddle wheels at will.

A false bottom of pine battens should be installed, and with lockers under the seats and at the bow the craft is ready for a cruise to distant fishing grounds. Its progress is leisurely and easy on the skipper.

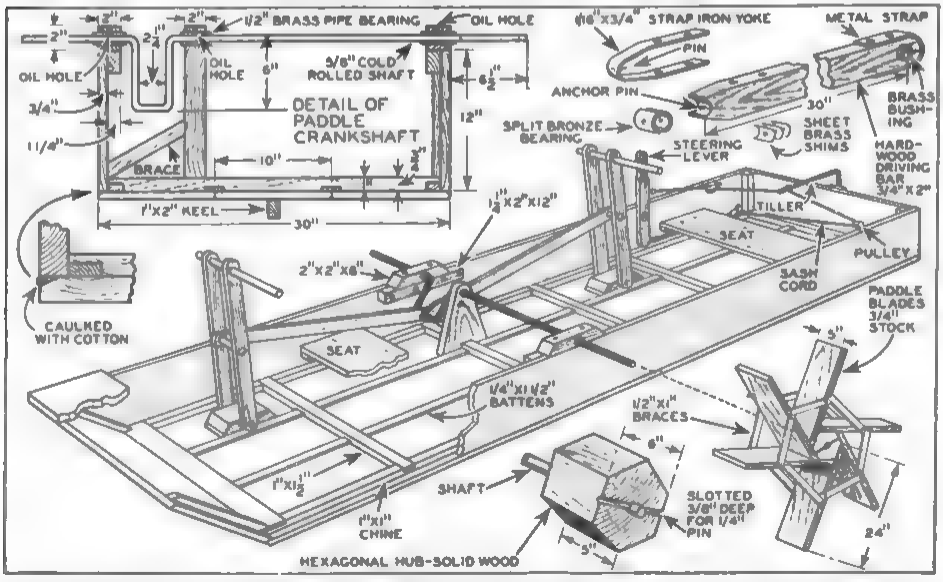
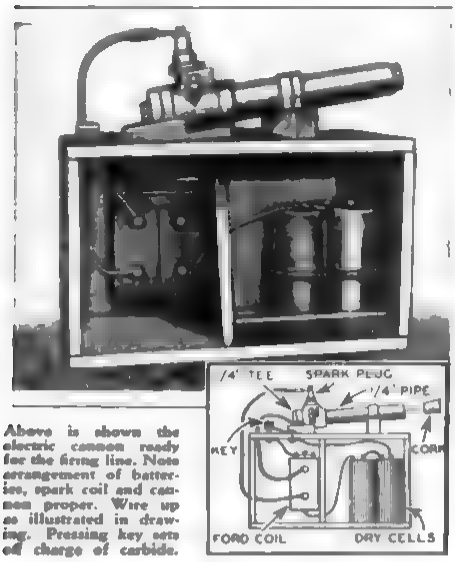


Fig. 2. Detailed dimensions of main parts above will guide you in construction. A false bottom of pine battens should be installed in hull, with lockers under seats for fishing equipment. Details of driving bar are seen in upper right corner.

"Carbo-Electric" Cannon Makes Big Noise at Small Cost



Above is shown the electric cannon ready for the firing line. Note arrangement of batteries, spark coil and cannon proper. Wire up as illustrated in drawing. Pressing key sets off charge of carbide.

IF IT'S big noise at small expense you're looking for, this little cannon has everything that could be wanted. As an explosive, it employs carbide moistened with a few drops of water, and a spark plug as a detonator.

The barrel is a 9-inch length of 1¼-inch pipe, screwed into a Tee and secured to a box with wooden blocks and pipe straps as shown. A solid plug is screwed in the back of the tee, and a plug for the top is drilled with a ½-inch pipe tap to take an old spark plug. Water is introduced through a priming cup.

An old Ford spark coil unit and four dry cells are arranged in the box and wired so that pressing the key will close the battery to the coil. High tension cable connects the secondary of the coil to the spark plug.

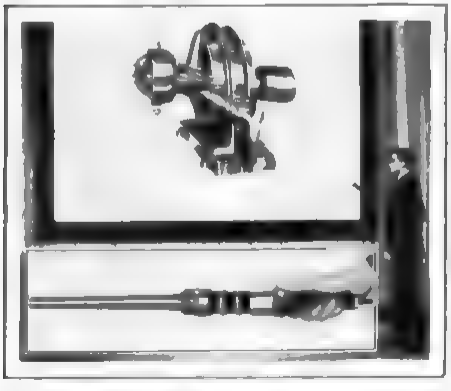
To fire, fit a cork into the muzzle, pour a little water into the priming cup so that it will drop into the carbide in the breech, and then press the key to the accompaniment of a loud bang.

Electric Pointer for Lecturers

COLLEGE professors no longer need to take their old-time fishpole to class when they deliver a lecture. Now they can "pack" an electric gun, that shoots little arrows of light onto a motion picture or lantern slide screen.

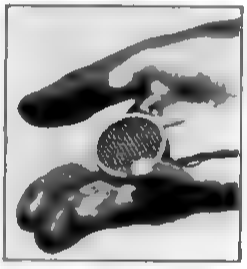
The new electric pointer, shown in the photo below, consists of a light-weight aluminum nozzle to the handle of which is attached a lead which can be plugged into any convenient outlet.

In the barrel of the pointer is an objective lens and a condensing lens, and between these two a diaphragm, or small slide, with the arrow on it.



125-watt lamp in barrel of electric fish pole projects arrow to any part of screen, while pressure on button tells lantern operator to change slide. Plugs into convenient wall socket.

Lapel "Mike" Has High Efficiency



Clearest reproduction is possible with this new lapel mike.

WITH the object of providing full freedom and more natural performance for speakers and singers on a stage or in the open, a new highly efficient lapel "mike" has been developed. Believe it or not but this new microphone measures less than 1¼ in. in diameter by ¼ in. thick, and weighs only one ounce, and despite this extremely small size it matches efficiency with "mikes" ten times its bulk.

An interesting point about the midget "mike" is the stretched gold-plated duralumin diaphragm, which permits full area of the metal to vibrate freely. Extreme fidelity is realized at all times, though the mike hangs in the pocket of the speaker.

We Have 10 Senses Instead of 5

NOT only do all normal human beings have the sixth sense proverbially counted as missing, but also a seventh, an eighth, a ninth and even a tenth, according to American Medical Association experts.

Of the additional senses listed, one is the temperature sense residing in special nerve endings in the skin and which enables one to distinguish between hot objects and cold ones.

Another sense includes the sensations from muscles, tendons and joints which enable one to sense the movements of the body or the positions of legs or arms.

MOTOR MECHANICS

Edited by RAY F. KUNS

An Outside Crane for the Wrecking Yard

A WRECKING yard or garage which has use for sturdy, serviceable outside crane will find the suggestion given in the photograph at the right extremely helpful.

Construction is as simple and economical as could be desired, three old car frames of similar length being all that is required for the job. The derrick shown was made from a Dodge, Star, and Ford Model T frame.

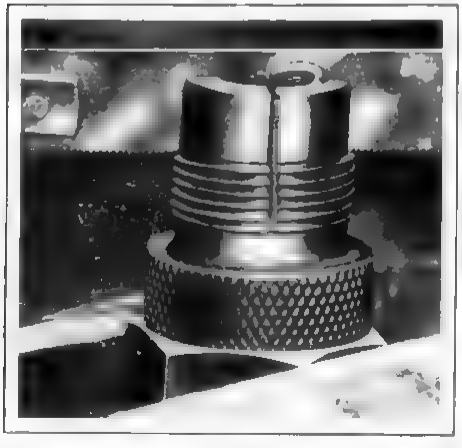
The ends of the upright frames are pulled together and held with bolts. At the top another short section of car frame is used between the uprights for a cross member. It is to this member, at the center, that the chain block is attached. Moving on a set of rollers the chain block will provide a high degree of flexibility and convenience.

Uprights and cross member at top of derrick are made from old frames from Dodge, Star and Ford Model T car.

Uses for Short Lengths of Hose

A SHORT length of rubber hose carried in the tool box of the car ofttimes proves itself a godsend in an emergency. It may be used as a means of siphoning gasoline from the main supply tank to prime the vacuum tank, to fill the camp cook stove, or for any cleaning use about the camp or about the car. On occasion it may also be used as a source of supply of gasoline for the stranded motorist, when you wish to play good samaritan, or perchance he will be a good samaritan to you.

Handy Die to Clean Engine Threads Made From Discarded Spark Plug



With hack saw, cut slots in end of the plug as illustrated. When turning, foreign matter accumulates in the slots.

BECAUSE carbon and other foreign materials accumulate between the screw-heads, it sometimes takes a lot of effort to remove the spark plug from the engine. The following will be found an excellent remedy for the situation.

Take an old discarded spark plug apart, discarding the porcelain or top part. Then place the lower part of the plug in a vise and using a hack saw cut a couple of slots down into the plug, as demonstrated in the photo at the left. Usually making two saw cuts at right angles to each other, dividing the plug into two sections, is sufficient.

Now remove the present spark plug from the engine and insert the die into the hole. Using a wrench, screw the slotted plug down as far as it will go. The foreign matter will be pushed from between the threads and accumulate in the sawed slots. It will be surprising how easy the good plug can be screwed down after the threads in the engine have been cleaned in this manner. Extremely handy, too, in tool kit.

Make MONEY with this

by **THEODORE A. HODGDON**

WHILE motorcycling is essentially a sport, there are various ways in which it can be made to pay dividends to ingenious and skillful motorcycle owners. In this article you will find full instructions for building a tractor type motorcycle capable of being driven across rough fields, up steep slants where cars could not possibly go, through swampy land where no ordinary motorcycle could go, and, of course, along highways of all kinds.

Sell Advertising Service of Vehicle

Once finished and in good running order, it should be possible for the motorcycle owner to approach garages, service stations, or almost any business establishment in his town, offering to operate his tractor motorcycle about town with signs upon it advertising the owner's business. This sort of a vehicle, when ridden up to the curbing or parked in the public square, would attract much attention, and the enterprising business man's signs upon it would be a very virile type of advertising.

The tractor attachment as shown in the drawing can be built by the average mechanically minded reader without a great variety of expensive tools. In one or two places, some machine work should be done, but these operations can be obtained in a machine shop at slight expenditure.

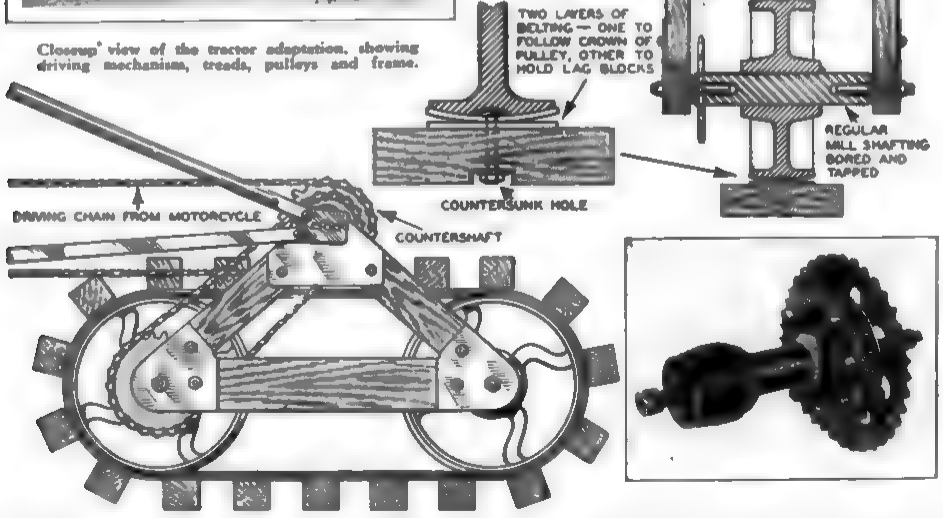
Tread Runs Over Pulleys

The tread arrangement is very simple, consisting of a double strip of mill belting, about 3½" wide, which runs over two old discarded mill belt pulleys. Of course, the pulleys which a reader may be able to obtain may be of varying sizes, anywhere from 12" up to 14" or 20", and it is merely necessary to design the main chassis brackets to fit these pulleys and give ample clearance in the motorcycle frame.

While the pulleys shown in our drawing are approximately 14" in diameter, it will be readily perceived that one of them could be as small as 10" or 12" and the other one as large as 24", if desired.

As every reader knows who has ever seen a great

Closeup view of the tractor adaptation, showing driving mechanism, treads, pulleys and frame.



Detailed drawing of the tractor's construction. The sprockets of the chain drive mechanism are the only units which require any machine work, and this can be done at moderate cost by any machine shop. The sizes can be varied.

TRACTOR Motorcycle

Money-making possibilities of the tractor motorcycle are demonstrated here. The unique appearance of the vehicle attracts attention and makes the sign a worth-while form of advertising which can be made to return considerable revenue.

ten ton caterpillar tractor operate, the principle of such a tractor is merely that it lays its own track as it goes along. Exactly the same principle applies to this tractor attachment for a motorcycle.

The main chassis of the tread is constructed of oak wood, 1½"x3", carefully put together with steel plates at the corners, as shown. Please note that the main chassis sides are designed in the form of triangles, with a steel plate fastened to the two top sides and apex of the triangle, pivoted on the axle center of the motorcycle. It will be found possible to obtain a strip of bar iron about the size of the old motorcycle axle, the correct length to hold the chassis members and allow them to pivot freely. (See drawing.)

At the ends of these triangles, steel plates hold the axles for the pulleys. The rear pulley is a free member while the front pulley drives the entire track mechanism. To obtain this drive, it is, of course, necessary to carry the regular conventional motorcycle drive by sprockets back to former position in the frame exactly as if the wheel were in place. Then, by means of two extra sprockets, the drive is transmitted to the front pulley of the tractor mechanism, as shown. It is in these locations that the machine operations may be necessary, but as mentioned above they may be obtained in a machine shop at little cost.

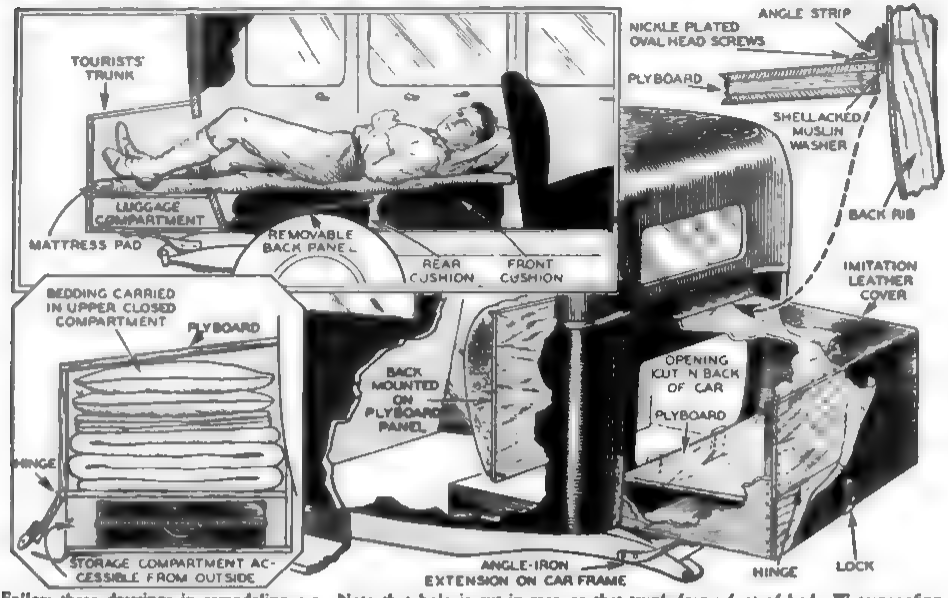
In obtaining your two strips of mill belting, it is advisable not to use old belts because they will probably be deteriorated and will not stand the strain of your tractor mechanism. However, if only old strips of belt are available, use three layers for your track instead of two. It is suggested that leather belting, owing to its uneven stretch, be avoided. Select rubberized canvas mill belting *which has been used* on crowned pulleys for a time so that it has adopted a shape which will hug the pulleys.

As soon as you have obtained these strips

(Continued on page 158)

Hills, swamps, plowed land are all the same to the tractor motorcycle, whose treads take it practically anywhere.

Here's Improved Way to Remodel Your Car for Sleeping



Follow these drawings in remodeling car. Note that hole is cut in rear, so that trunk forms foot of bed. Waterproofing is provided by means of shellacked muslin strip between angle strip and metal of body. Lower compartment carries luggage.

THE usual method of remodeling a car to provide sleeping accommodation, by cutting and hinging the back of the front seat, has proved unsatisfactory in many cases.

In designing a car, particularly closed models, the rigidity of the back of the front seat is depended upon to give support to the top. When this point is weakened by cutting, the whole body becomes loose; the doors mis-align and rattle; the "used car" value is greatly depreciated.

Herewith is shown a method of remodeling a car which provides very comfortable sleeping accommodation for two, and, at the same time, does not materially weaken the body. In this case, the back of the rear seat is cut away to give leg room to the sleeper. Drawings above show this re-arrangement.

Back Seat Mounted on Panel

The upholstery on the back of the rear seat is removed and mounted on a plyboard panel, which is then screwed in place to restore the seat-back. Some cars of the "business man's sedan" type are fitted at the factory with removable panels. In any case, an auto upholstery worker can do this job at a small cost.

The drawings show how the body-ribs and metal are cut away to make an opening in the back of the car. This communicates with the upper section of what appears to be an ordinary tourists' trunk on the rear.

This trunk is made of plyboard or of sheet metal, and where it joins the back of the body, it is edged with angle strips of nickel-plated brass or of "Monel" metal. Shellacked muslin between the surfaces assures a watertight join.

If the trunk is made of plyboard, it is best to cover it with imitation leather to enhance its appearance. A metal trunk can be treated with auto enamel. Of course, angle-iron extensions on the car frame support the trunk from beneath.

Bedding Carried in Upper Compartment

The size of the trunk depends upon the size of the car. The distance from the back of the front seat to the back wall of the trunk should be about 6′ 6″.

Note in the drawings how the seat cushions and the removable back panel are rearranged to form the bed. A thin mattress pad, preferably of kapoc, is placed over the cushions. Blankets and pillows complete the arrangement.

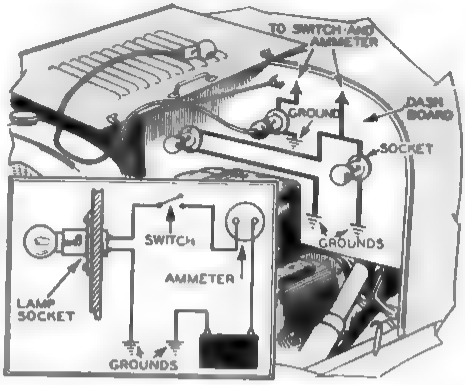
All the bedding is carried in the upper compartment of the trunk when "on the road," and is absolutely free from soiling and from dust. Even in a downpour of rain, the bed can be made up without getting out of the car.

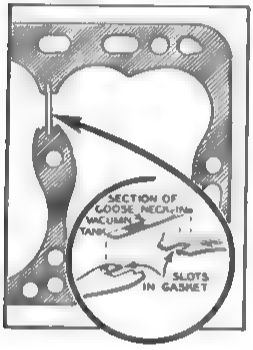
The lower compartment of the trunk provides additional carrying space, particularly suitable for one or more suitcases.

The foregoing method of remodeling a car for sleeping will not materially weaken the body. Any weakening resulting from cutting away the back section is later amply reinforced by the rigid fitting of the trunk. Care should be taken that all wood-screws engage in the wood-work of the body. In some cases, No. 10 machine-screws and nuts must be used instead.

Adequate Engine Illumination Makes Repair Job Easier

THE home workshop enthusiast can easily fit up the hood of his engine with trouble lamps that will come in plenty handy in engine repair jobs. The first step is to fasten three sockets in the dash in the positions shown in the drawing at the right. Then run one wire from each socket to the ground connection, which may be under a bolt. Run wires from the other side of each socket, connect them together, then carry the common wire to the switch on the instrument panel, thence to the live side of the ammeter. The extension light in the center is plugged into the socket, and is carried in the tool kit when not in use. Such a light affords ample illumination when working on the engine. Protect the extension light with cage guard.



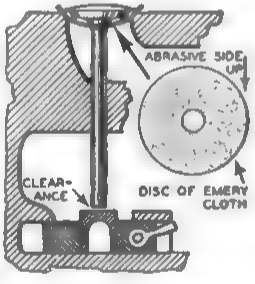


Emergency Gasket Repair Stands Hardest Wear

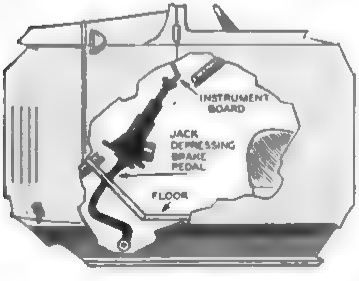
WHEN your car has been subjected to a long grind, you may learn to your chagrin that the engine is missing, or rather that a cylinder is missing. At high speeds the car may hit on all six, but on low speeds, not so good. When the cylinder head is off, the fault may be apparent, but not the remedy. If you ever run into this situation, however, here's what to do about it. Casting an eye over the car you will notice a little goose neck on the vacuum tank, all of which isn't necessary. So cut a short length off this, flatten it out and shave it down to the same thickness as the gasket. Then with a hacksaw cut a slot in the gasket, and fit the hose section in this, as illustrated at the left. Where this stunt was used, the repair showed no signs of giving in after 1500 miles of hard driving.

Emery Cloth Patch Aids in Job of Grinding Valve

FREQUENTLY when the home workman attempts to grind a valve he finds that the valve seat in the cylinder and the valve face are badly pitted and have on them a very hard scale. In order to remove this scale, take a piece of emery cloth and cut it of a size approximately the same as the valve head, just a bit larger. Punch a hole in the center of this emery cloth and insert the valve through the hole, having the abrasive side of the emery cloth up. Drop the valve into position in the block or head and by turning the valve the face will be polished and the scale removed. In order to recondition the valve seat, reverse the cloth patch on the valve. It is well to allow just enough of the emery cloth to extend in order to grip it and cause it to turn, if it is inclined to stand still and does not turn as it should.



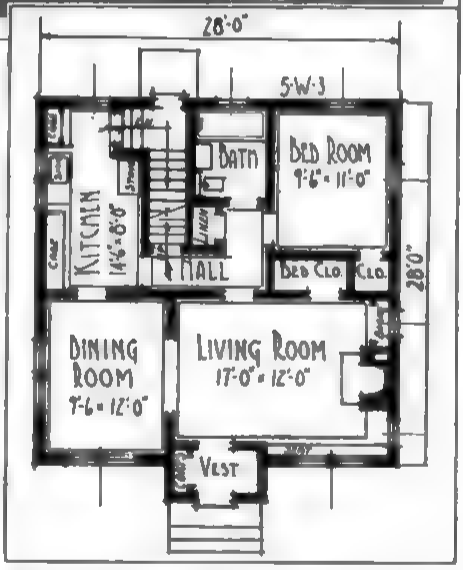
Jack Depressing Pedal Makes Easy Even Adjustment of 4-Wheel Brakes



A BORED assistant is usually required to depress the pedal when you are adjusting the brakes, but this arrangement will relieve the boredom and the helper. First, set the jack in place to hold down the pedal as illustrated at the left, then go around and jack up the hind wheel. Expand the first jack in the car just enough to cause a noticeable drag when jacked-up hind wheel is turned by hand. The brake band of this wheel is then adjusted to drag very strongly when turned by hand. The other three wheels are then jacked up and operated on in a similar manner. When the job is completed, and all the jacks are removed, the four wheel brakes will be found in perfect adjustment. The only care necessary is to see that each wheel displays equal resistance.

The REALLY CHEAPEST

This attractive little Colonial Bungalow, built from plan No. 5-W-3, saves you almost $1000 by making space do double duty. Fireplace and large living room are features.



First floor plans for house No. 5-W-3, shown at top of page. Dining room and living room open into one another, forming one large room. For complete blueprints for any of these houses, send $1.00 to Modern Mechanix and Inventions Home Building Editors, 529 S. 7th St., Minneapolis.

In the last analysis the really cheapest house to build is not the one of lowest cost, but the one of best construction. You can skimp and conserve with low-price materials but you'll pay heavily for it later. The three houses shown here are really inexpensive because the materials and the plans are of the best.

YOU often see and hear the word "cheap" used in referring to low cost houses. Don't be fooled by that word.

Just because a house doesn't run into thousands of dollars does not mean it is cheap. Not at all. A low cost may result because some smart designer used old materials in a new way, made one room do the work of three and by other space- and labor-saving devices was able to cut costs perhaps a third. The house may be as sturdy as the Egyptian pyramids.

No one wants a cheap house. By cheap I mean a house structurally bad, a house where skimping and skinning is the watchword. Here are a few things a cheap house may include: Poor foundations because not enough cement is used. Footings thin and shaky. Wooden supporting posts in the basement set on concrete bases. (The bottom of such posts will rot and the house will settle causing cracks in side walls and ceilings.)

Bridging and bracing may be omitted in a frame house. In masonry walls the mortar may be weak. Brick courses may be crooked. Siding for exterior walls may be thin and inferior grade. Sheathing paper

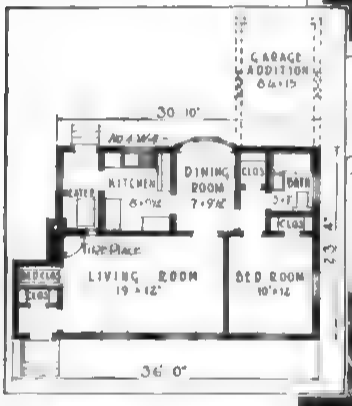
HOUSE to BUILD

by Maurice I. Flagg

How to Get a Blue Print and Two Plan Books

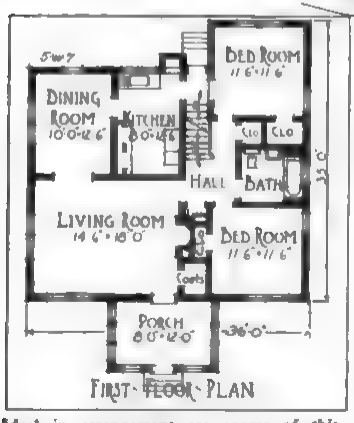
A one-sheet blue print of any house appearing in Modern Mechanix and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, "Homes for Newlyweds," containing 32 of the latest ideas for low cost homes in all styles, and "16 Selected Homes for Lean Purses" containing time, space and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanix and Inventions Magazine, Minneapolis, Minn.

House No. 4-W-4 is a modern kitchenette apartment in equipment. It offers only one bedroom but has an extra closet for fold-away bed.



Floor plans for house No. 4-W-4 above shows how basement is dispensed with in favor of a heater room next to the kitchen.

House No. 5-W-7 is most commodious bungalow of the three shown herewith, having two bedrooms, a dining room, and living room with fireplace. Also space on second floor for storage and sleeping quarters.



Ideal in arrangement are rooms of this shingle exterior bungalow, Plan No. 5-W-7.

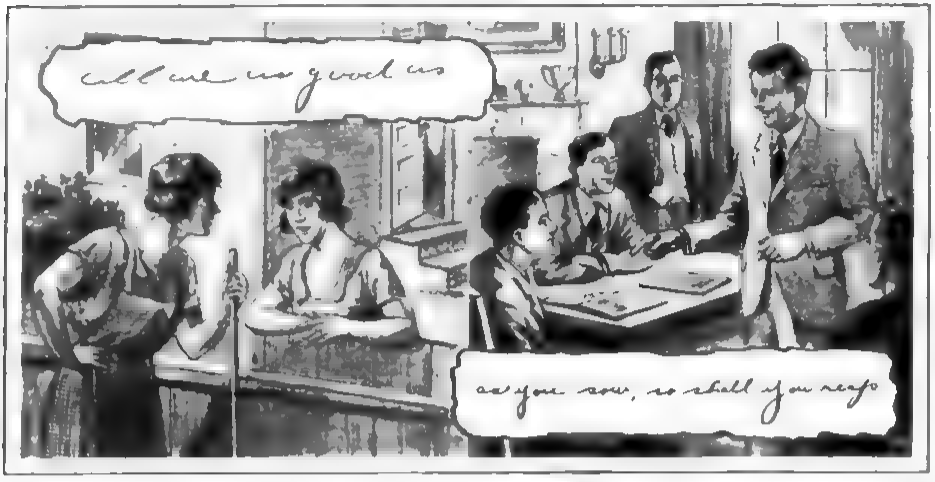
may not be flashed around openings. Openings between paper courses may not be weatherproof. Subfloors may not run diagonally. Double joists may be omitted around chimney stacks and stair wells, etc.

And so it goes all through a cheap house. If you buy or build such a house it may weave, bend and buckle in the face of the first husky storm. There's nothing much to do about it except grin and bear it. It's the price you pay for "cheap" construction.

On the other hand, there's many a small house where the construction is excellent, the materials of fine grade and the price is well within an average size pocketbook. That's the kind of house most folks want. An expensive house may prove to be a cheap one if it isn't well built.

(Continued on page 146)

What Does Your Handwriting Tell?



M. N. Bunker, world famous grapho-analyst, has discovered that the way a writer makes his A's and O's is extremely revealing in the matter of character. Unclosed tops to these letters indicate a weakness for indiscreet gossip, while closed tops reveal expressive but cautious and discreet nature. Such a person can be trusted to keep a secret under most trying conditions. For analysis of your handwriting send 10c to M. N. Bunker, care of Modern Mechanix and Inventions.

IF YOU want to know your friends' ability to keep secrets, look at the way they write their "a's" and "o's".

Mr. M. N. Bunker, world-famous grapho-analyst, says that this is an infallible way to detect the "talkative" side of a person's nature. He knows this to be true because he has analyzed thousands upon thousands of different specimens of handwriting - and that little rule has never failed.

If a writer makes his "a's" and "o's" like those at the left above you may know that he is a gossip—that he will talk not only about his own personal affairs but about those of others. Anyone who consistently leaves the tops of his "a's" and "o's" open may safely be accused of being unable to keep a secret and of talking too much.

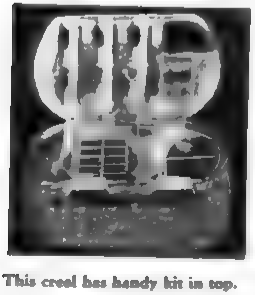
Why this is true lies deeply imbedded in scientific facts regarding the relation of the movement of the fingers in conjunction with mental processes.

A person may ordinarily be reserved and quiet in manner but if he writes his "a's" and "o's" as in the specimen at the left, you may be sure that when he does say anything it will be something which he has no right to say. However, usually it is the expressive, highly emotional type of person who does not close up these two letters.

A person may be expressive, on the other hand, and still not be "gossipy." In such a case, the "a's" and "o's" will be closed at the top as shown in the specimen at the right. You may safely confide in any friend of yours who writes in this manner. He will not give away your secrets, but will guard them as his very own.

The science of handwriting analysis, however, does not confine itself merely to the "a's" and the "o's". Every letter that you write means something to Mr. Bunker, and most of the letters mean many things.

Your latent powers and talents, as revealed by your handwriting, will be analyzed for you by M. N. Bunker for ten cents, enclosed along with a specimen of your writing and a stamped, self-addressed envelope. Address Mr. Bunker, care of Modern Mechanix and Inventions, 529 So. 7th St., Minneapolis, Minn.



This creel has handy kit in top.

Handy Kit in Top of Creel Holds Angler's Supplies

AN ALUMINUM kit containing many compartments and trays replaces the customary reed lid on a new type of fishermen's creel recently introduced. The under side of the lid has clips and spaces for holding extra line, hooks, line dresser, etc.

On raising the lid, an aluminum tray is exposed. It is divided off into numerous compartments which are closed by several small hinged covers. These little compartments provide space for sinkers, shot, flies, scissors, tweezers, flash light, and the many other items necessary to have along on a fishing trip. A large hole both in the cover and the tray forms an air passage to the fish kept in the basket below the tray. The kit is made in several sizes to fit basket creels of standard shape.

Clean Packaged Ice Delivered From Refrigerated Truck

25-lb. cakes of ice are removed from magazines of the refrigerated delivery truck as illustrated here. The interior of truck is divided into two main compartments by refrigeration coils, which are filled with cold brine at ice plant.

A NEW type of ice delivery truck that is fully insulated, has its own refrigeration system, and delivers packaged ice from a series of magazines, has been invented and placed in use recently in Los Angeles.

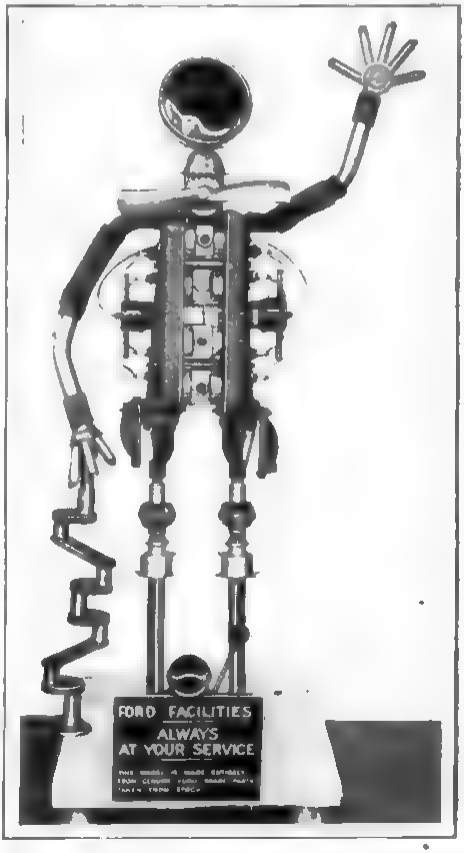
These door-to-door delivery trucks are completely enclosed, and the interior is divided into two main compartments by refrigeration coils placed vertically down the center. The coils are filled with cold brine at the ice plant, and a near zero temperature is maintained in the truck during its route journey.

The truck has six rear doors, each door being served by three magazines running lengthwise the body. Wrapped and sawed pieces of ice are placed in the magazines, the capacity of the truck being 196 25-lb. cakes. A metal handle attached to the magazine allows the cakes to be removed, one at a time.

Latest in Robots—Mechanical Man Made Entirely From Ford Parts

LOOKING at the thing in the photo at the right, you might think it a mechanized version of Sir Harry Lauder, the singer, but that's not the truth. What it is is a robot made up entirely from Ford spare parts and used to advertise Ford service.

The thing was made, not born, at Walford, England, in the shops of a Ford service station, and has attracted quite a lot of attention since it went on display. As a cane, the robot has a crankshaft, as a tie he wears a fan blade, etc., etc.



No, not a mechanical caricature of Sir Harry Lauder, but a robot made entirely of Ford spare parts, and displayed in English Auto Shop for advertisement purposes.

Nature Changes Dunes to Forests

IN GOING about the task of reclaiming the sandy wastes like the wind-blown dunes of Long Island, Nature makes each kind of plant take its turn at the job, explains an eminent botanist. The plant must contribute some bit of effort to the task, and give way, at the proper moment, to some other kind of plant more capable of performing the next job in line.

The first growth on the sandy wastes consists of a few scattered weed-like plants which manage to survive the winter. In the meager shelter of these plants there soon appears the bunch grasses which gradually grow over the sandy surfaces. Thus in a few years the shifting sands are tied down and the winds defied.

In the grassy area, shrubs next take root and gradually oust their predecessors, the bunch grasses who prepared the ground. Sheltered by these shrubs, the first of the trees sprout up, creating a pine barren. Next oaks grow up in the shade of the sheltering pines and oust the pines by their more abundant and hardy growth.

Thus over a course of years the original dune land is converted into a forest by the onward-moving and ruthless processes of Nature, which ever uses her victims as a means to an end.

Balloon Racing—Sport of Surprises

(Continued from page 58)

Many Americans are little interested in ballooning because of the extremely short distances often made in races, which hardly seem worth the amount of trouble involved in preparation. The fact that a race must be staged from some city selected for financial reasons rather than suitable conditions, and on a date chosen without regard to the weather, is responsible.

If one could pick his starting point and time, as did Berliner and his companions when they set the 1800 mile record in 1914, all would be different. When I won four national elimination races in a row, 1924 to 1927 inclusive, I never but once came near the American distance record, and that was the 1,072 mile jaunt in 1924.

The next year, starting from St. Joseph, Mo., I landed at Reform, Ala., 585 miles away. In 1926, starting from Little Rock, our Goodyear bag came down at Petersburg, Va., 848 miles away. In 1927, when we started from the home airport here in Akron, the landing was at Hancock, Maine, 718 miles distant. The winning streak was broken by the storm at Pittsburgh in 1928, and Captain Kepner, winner that year, made but 261½ miles, landing at Weems, Va.

Lieut. T. G. W. Settle, navy pilot, made a good distance the following year, when the race also started from Pittsburgh, coming down at Savage Harbor, Prince Edward Island. In 1930 Roland J. Blair, with a Goodyear entry (having won the Gordon Bennett race the year before I, as defending champion, did not have to compete in the elimination) flew from Houston, Texas, to Greensburg, Ky., 768 miles. Last year's winner was Lieut. Settle in his navy craft, with only 195 miles, while F. A. Trotter and Roland Blair, with a Goodyear entry, were second with 185 miles.

People often ask why, at 38, I keep on racing balloons, a sport in which I first appeared as winner of the national race back in 1919. The answer probably is that I have been associated with balloon and aircraft making ever since I graduated from Case School of Applied Science, at Cleveland, back in 1917. Immediately after graduation I joined the Goodyear Tire & Rubber Company as civilian instructor at the naval air station, Akron.

I qualified as a free balloon and dirigible pilot in 1918, and continued as a naval instructor throughout the war. Since then, as an aeronautical engineer in the Aero Design Division, development engineer in the Development Department, and director of the ground school of Goodyear-Zeppelin, all of my work has been connected with balloons, dirigibles and airplanes.

As inventor of the lightning arrester, landing pontoons for free balloons, protective canopy for balloons, a leak, bullet and crash proof gasoline tank for airplanes, new method of processing balloon fabric, an alarm altimeter, new type vertimeter, and a special balloon fabric, I believe I have been able to contribute something to each of the three branches of air navigation, besides testing some of my own inventions in balloon races. For us here at Goodyear the races are not just a sport. They are to our balloon and airship department what the 500-mile auto race at Indianapolis is to automobile builders—a testing ground for new improvements.

The Really Cheapest House to Build

(Continued from page 143)

When it comes to initial cash outlay the all wood house shows a lower figure for each per 100 square feet. The following figures illustrate the price differential between lumber, brick, stucco, etc., before materials had struck their present rock bottom levels.

All wood frame house per 100 square feet costs $44.07. Wood and stucco on wood lath, $53.00 Wood with stucco on metal lath, $55.91. Wood with common brick veneer, $80.38. Common brick 8-in. wall, $73.95. Common brick 12-in. wall, $103.76. Hollow tile wall $83.93.

To illustrate my point about low cost houses of good construction I have selected three for this issue, all bungalows of wood construction, which means good construction. They will look equally well if done in stucco and might even be built of brick if you prefer.

Plan No. 4-W-4 is a modern kitchenette apartment in equipment, size and service, but in this case you have it all in a detached house of wood construction, shingle side walls and shingle roof. While the house offers only one bedroom, a specially designed closet off the living room contains a roll-away bed.

The house has been planned without a basement. A heater room next to the kitchen will accommodate both fuel and first floor heating plant.

The dining room is an enlarged alcove with triple windows. Kitchen is compact and planned to save steps and labor. A fireplace in one corner of the living room is a feature. It accommodates two flues. This is a saving. The fireplace may be omitted which would reduce the cost $200 to $300.

What about the price? Under present day prices this is what may be called a $4500 house in round numbers.

Plan No. 5-W-3 is tabloid type. The style is Colonial and construction is frame with siding exterior and shingle roof. A bed closet in the living room along with the rear corner bedroom offers two-bedroom service.

This house has a cellar. A fireplace flanked with book cases and seat extending below the front windows of the living room is a feature Both living room and dining room open onto one another and thus make what amounts to one large room occupying the entire front of the house. Kitchen and bathroom complete the first floor equipment. Here is another house that should be within the $5000 price range.

Plan No. 5-W-7 is a somewhat larger bungalow done in frame with shingle exterior and shingle roof. The enclosed porch is a feature. Two bedrooms, a dining room, living room with fireplace, bathroom and kitchen are contained within the first floor area. There is space above for storage and additional sleeping quarters.

A full or partial basement will be satisfactory. The plan shows an ideal arrangement of rooms and the house is one of those simple honest types that satisfy. The cost to build under present day prices should be around $5000 and perhaps less if fireplace is omitted and equipment is kept simple.

Hotter than Coal
and no dirt

A New Invention

Do away *forever* with the drudgery of wood and coal. The most simple and economical invention on the market is now giving perfect satisfaction to enthusiastic users everywhere. This new invention is a new type of oil burner that takes the place of wood or coal and automatically and silently changes cheap oil into one of the quickest and hottest fires known.

Burns 96% Air and 4% Cheap Oil

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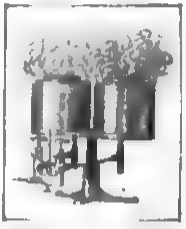

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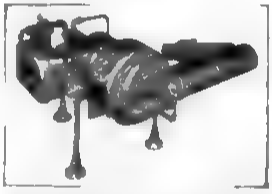

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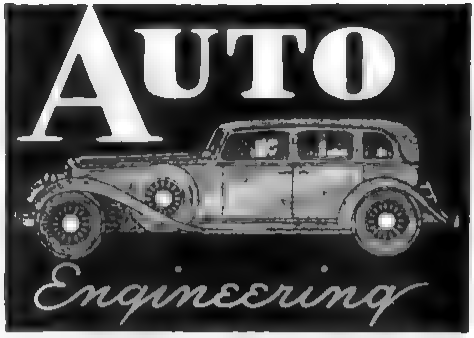

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Compressed Air Model Plane

(Continued from page 106)

made of high-grade tool steel. Then all the superfluous material can be cut away.

The crank-shaft proper can be made hollow, and plugged, of course, to prevent the escape of air from the crank-case, and the crank-throws themselves can be channeled out, or be drilled with longitudinal holes.

Note that the "idle" end of the crank-shaft is shorter than the length of the bush. The end of the bush is sealed with a plate soldered over the end. The salient dimensions of the crank-shaft are appended to the drawing.

Now about the cylinders. These are made of very thin-walled, steel tubing, approximately ½" inside diameter. The tubing must be reamed or ground to be perfectly round inside. If the finished dimension exceeds ½", the pistons can be made slightly larger to fit.

An excellent way to true up and polish the inside of the tubing is with the use of a lead lapping tool. This can be made by casting a lump of lead (or "half and half") to the end of a ⅜" rod. The lead is then turned down until it just enters the tube.

The lead is then coated with fine emery powder and oil and is worked in and out of the tubing, turning, of course, the while. Fifteen minutes lapping should result in a truly round, smooth hole.

After the inside of the tubing has been dressed, it is cut to cylinder lengths, and each piece is slipped on an arbor, and turned or ground down to leave a 1/64" wall. With the arbor still in place, a 1/32" steel disk is inserted in one end and the end of the side wall is peaned over it.

Afterward the join is soldered or brazed. If brazed, care must be taken that the cylinder is not distorted by the excessive heat. If this happens, the cylinder must be lapped out again.

The holes in the crank-case are now scraped out to receive the cylinders, and the cylinders are set temporarily in place, and the port holes laid out as shown in Fig. 6.

Accuracy must be employed in laying out these holes. The dimensions are given from the centerline of the crank-shaft. After the holes are bored and all burrs removed, the cylinders are set aside and work proceeds on the connecting rods.

These are made, preferably, of duralumin. If this alloy is not readily available, plain aluminum or brass can be used. The construction of these forked rods is quite obvious from the drawing (Fig. 4). Note how they interlock on the crank pin. The fork at the piston end of all rods is the same, but the crank pin ends are made up in pairs.

The rods do not turn directly on the crank pin or on the piston pin. A split bush of .008" shim stock is interposed between. The shim stock serves as the true bearing, while the rod ends rock on the outside of the brush. This is similar to V type automobile motors, as the Cadillac

The construction of these rods shows the necessity of the demountable crank-shaft. If the rods are made of brass, they can be soldered and the rivets be eliminated.

Next the pistons, which are shown in Fig. 10. These offer no difficulty to the experienced me-

(Continued on page 150)

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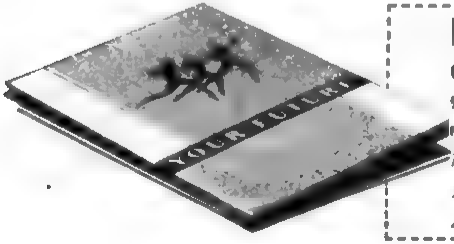

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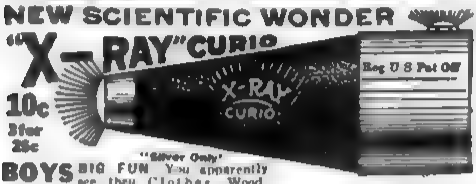

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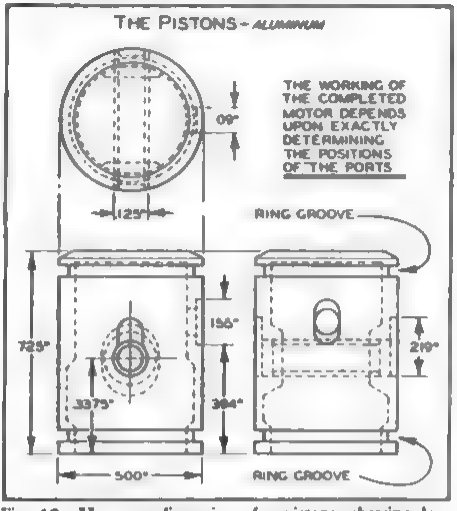

Fig. 10. Here are dimensions for pistons, showing locations of ports. The pistons are of thin-walled steel tubing, ⅛" outside diameter. They should form a press fit.

chanic. It is suggested, however, that the inexperienced amateur obtain ⅛" piston castings from a model builders' supply store, and have a machine shop dress them down to size and mill out the ports.

Also make the piston rings. In lieu of cast-iron piston rings, several windings of soft, cotton cord —candle-wicking—treated with oil and graphite, can be wound in the ring slots and will serve quite satisfactorily. One of the most essential factors in the piston construction is the accurate location of the ports. The dimensions given must be rigidly adhered to.

The piston pins are of thin-walled, steel tubing ⅛" outside diameter. Note that the length of the piston pins is ⅜" so as not to obstruct the elongated ports. The pins should be a press fit into the pistons.

Now about assembling the units. First the rods are permanently fitted to the pistons. Then the other ends of the rods are set in their respective holes in the crank-case. The crank pin of the dismantled crank-shaft is inserted through the connecting rod ends, with .008" bushing in place, and the crank-shaft is put together permanently.

The side plates are now placed in the sides of the crank-case, and soldered permanently. Next the cylinders are slipped down over the piston. Before soldering them to the crank-case, carefully check the port openings. If all dimensions have been adhered to, these will be found O K. Then solder the cylinders to the crank-case. Of course, use as little solder as possible.

The connecting tubes are of ⅛" copper tubing which has been reamed and turned down to a very thin wall. To make a neat bend in the tubing, it is best to run melted lead into the tubing. After this has set, bend the tube to shape and then melt out the lead. The ends of the tubes are soldered over the openings in the cylinder walls. Care must be taken that the solder does not flow into the openings.

Compressed Air Model Plane

Another length of ⅛" tubing serves as air inlet to the crank-case. The flow of air—the pressure—is controlled by a small, needle-valve cock such as are used on toy steam engines.

There! The engine is finished. Hook up an air tube to the spare tire on your car and see this baby run. Running without load on a full throttle, she surely will hum, and she will turn a ten-inch prop at a husky rate. Do not attempt to hold the shaft with the pressure on. To do so you invite buckled connecting rods and a wrapped crank-case.

Our next job now is to build the fuselage. In this plane the fuselage is an air tank of remarkable strength, capacity, and light weight and will run the motor for two minutes or more, depending on the throttle valve opening. With this powerful power plant unit, one can experiment intelligently with various wing constructions.

Fig. 7 illustrates the general appearance and construction of a compressed air tank-fuselage

If you possess a screw-cutting lathe; are adept at sheet metal work; and are cunning with a soldering iron, you can make an all-metal tank that will withstand a very high pressure, yet be light enough to permit flight.

The more advanced mechanic, with a lathe at his disposal, will probably prefer to make an all metal air tank. The metal tank will carry a much higher air pressure—up to 100 lbs. The constructional details of an all metal tank are shown in Fig. 7.

The first operation is to make forms of maple—or any hardwood—over which the sheet metal dome ends of the tank are spun. Fig. 7 shows how the brass disks are spun over the forms. A maple stick with a highly polished ball end held on the tool-rest will serve as a suitable spinning tool.

It is usually necessary to anneal the brass several times before the dome is completely formed. This is done by removing the partly shaped dome from its form, heating it evenly to a cheery red, and then plunging it in cold water. Heavy grease applied to the surface will also aid the spinning. .008" sheet brass is recommended for the domes.

After the domes are made, the body of the tank is formed with .005" sheet brass. Lighter metal is used here because it is afterward wire wrapped. The domes are now soldered to the ends of the body. The front dome can be joined with a lap join, but the rear dome must be merely sweated in place. Care must be taken that a thoroughly "sweated" join is made.

The body of the metal tank is wrapped with wire instead of with thread. About 45-gauge "monel metal" or piano wire is recommended. If one has a screw cutting attachment on one's lathe, it is a very simple matter to rig up a guide for the wire. Otherwise one can fix up a jig as shown in Fig. 9. About ¼" of the windings at each end of the tank are soldered to the tank.

Now for attaching the compressed air motor. The motor can be soldered directly to the forward dome, as is the air tube. It is well that a little control valve be installed between the tank and the motor to hold down the speed. A No. 3 machine screw can be fitted into an elbow in the tube and will act as a needle valve.

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Grow "Ermine" Coats in Back Yard

(Continued from page 85)

ley, chard and beet leaves, are fed in small amounts. In every instance, the most successful growers insist that the rabbits should be given time to clean up virtually all their feed from one meal, before they are given another. An abundance of water is an essential, but it must be placed in dishes fixed at such a height in the hutch that the rabbit must stand up to drink.

The back-yard rabbit grower should first of all obtain and study the voluminous literature published by the U. S. Department of Agriculture, Washington, D. C., and of a number of the states. Most of this may be obtained through the agricultural colleges of the universities of the various states. All of it is accurate, conservative, and the result of actual experiences over a long period of time in a highly-specialized industry. Furthermore, all of it is free to the interested individual.

Companion Receiver for Radiophone

(Continued from page 125)

One word about operating a five-meter receiver. If, when you first turn it on you do not hear any signals it will probably be because there are none within receiving range. The transmitting range at five meters, for high power as well as low, seldom exceeds 30 to 40 miles.

Five meters is essentially limited to local work and from five to fifteen miles seems to be the most useful range. A five to ten foot antenna is usually sufficient, but its height has much to do with reception. So operating the receiver from a room high in the house will probably prove most effective.

Use a good ground and fully charged A battery and fresh B batteries to insure quiet reception. A sure test to see if the thing is actually working at the start is to idle the car nearby. The ignition should so affect the receiver that you will know it at once.

With 90 volts on the pentode voice transmission can be picked up on a good speaker, although 133 volts may be necessary from a distant transmitter. For phone reception 45 volts may be found sufficient.

Combination Belt and Drum Sander

(Continued from page 133)

Later, in fitting the bearing, you will have to do a little scraping. Drill an oil hole in one side, and your bearing is complete.

The bearings are mounted in notches in the wood box sides. (See Fig. 1.) There is a single pair of notches for the roller that provides the drum-sanding facilities, and two pairs on the opposite edges of the sides.

These latter pairs are cut so that the bearings are adjustable by sliding the babbitt blocks back and forth, to adjust belt tension. Blocks of wood or metal hold the babbitt pieces in place, as illustrated in Fig. 4.

When wood is used, it is a good idea to run the oil holes in from the sides of the bearings, at about 60 degrees to the shaft.

The drum side of the sander has a wood top with a slit in the center. (See Fig. 6.) This slot

Combination Belt and Drum Sander

is about 2¼x4¼ inch in size. The portion of the top above the box sides should not be much more than ¼ inch thick. It is necessary to reinforce it with blocks on the under surface.

One end of the top is hinged to the end piece, and the position of the other end is regulated by an adjusting screw, so that the depth of the cut can be controlled as shown in Figs. 1 and 6.

The belt-sanding surface on the opposite side of the box is provided with a wood or metal piece, preferably the latter, beneath the belt section; and wood guards at each end, as shown in Fig. 4. In placing these guards and the center section, leave enough room for the rollers and belt to clear the edges.

The center piece is held with four screws, as it must be removed when belts are changed. The rollers, too, are taken out by unfastening the bearing clamps. It is necessary to adjust them for each belt used.

Each shaft is equipped with a pulley; and on one of them, preferably the drum-sanding cylinder, a double pulley is used. See Figs. 2 and 4. A belt runs a three-cornered path to all drums, delivering power evenly to each one. This makes more positive the belt action, especially for heavy cuts. One groove of the double pulley receives the belt from the motor.

You can obtain sanding belts 3 in. wide and in various surfaces from many 5-to-a-dollar stores. From the same source you can get the shafting, pulleys, metal rollers, turnbuckles and belting.

You can purchase babbitt bearing metal at almost any large hardware store. Obtain the belt first, and build the sander around it. The belt used on the machine illustrated is about 28 in. long. The triangle formed by the centers of the three shafts has a base of 8¼ in. and sides each 7¼ in. long, the base being that portion along the belt-sanding side.

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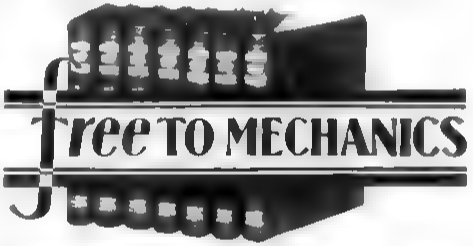

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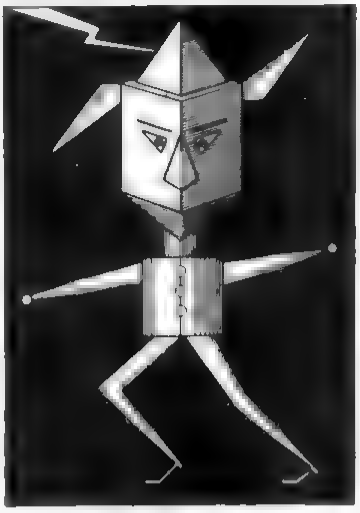

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Yes, the Climate *Has* Changed

(Continued from page 79)

layers make it possible to distinguish between the successive annual deposits, which are called "varves." Since there was more melting and a greater transport of sediment in hot summers than in cool summers, the relative thickness of the varves furnishes an indication of the relative warmth of the years when the deposits were formed. Hence many series of varves have been measured for the purpose of tracing the fluctuations of ancient climates.

The evidence available from all sources, instrumental and otherwise, now seems to show that climates are always changing, but that their changes are always temporary. Warm periods are followed by cool periods, wet periods by dry. The man in the street is therefore right when he asserts that climates change, but he is wrong when he implies by his assertion that they stay changed.

Many authorities believe that climatic variations are not haphazard and fortuitous, but occur in a more or less rhythmical way, so that their periods can be determined by methods of mathematical analysis and perhaps eventually be made the basis of successful long-range weather forecasting. A great number of climatic "cycles," ranging in length from a few days to several centuries, have been announced by various investigators, but none of these are so clearly defined as to be universally accepted by meteorologists.

The one most widely recognized at present is that known as the Brueckner Cycle, named for the late Professor Eduard Brueckner, who found that average conditions of temperature, rainfall and barometric pressure for large groups of stations in different parts of the world vary, within comparatively narrow limits, in an irregular period averaging about 35 years. Some investigators report finding traces of the well-known 11-year sunspot period in weather records, which seems plausible since sunspot variations are related to variations in the amount of heat given off by the sun, and solar heat is the source of all our weather.

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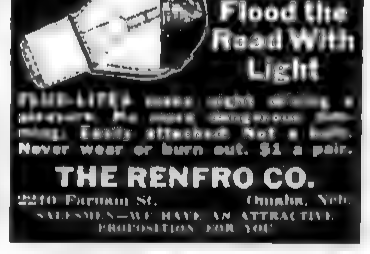

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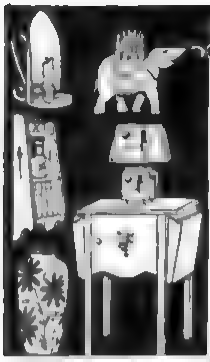

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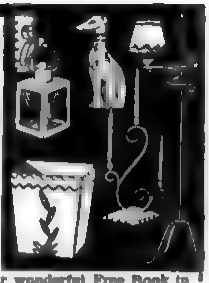

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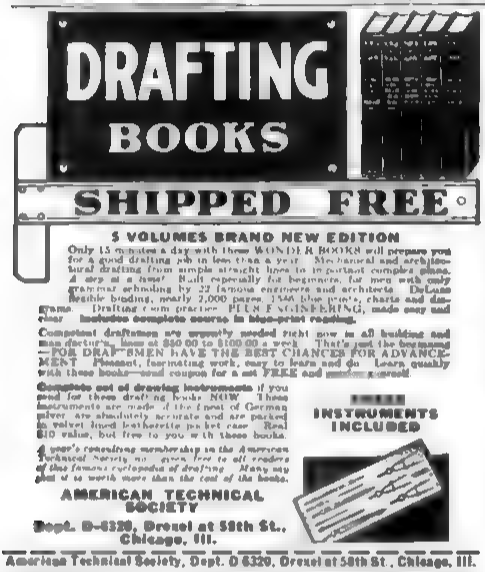

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Houses That Hang From a Pole!

(Continued from page 43)

deep rose, then to blue and all the colors of the spectrum. Our host then demonstrated that it could be deflected from one room or another at will.

"This way," said Mr. Fuller, "to the waterless bathroom." We entered the white and slightly oblong room, but there was neither tub nor shower. "Bathing is accomplished with a quart of water and a fog gun," explains Fuller. Reaching into one of the now familiar revolving wall cabinets, he removed an instrument much like a pneumatic paint gun. Our guide then turned the instrument onto his own hand. A very fine spray was emitted and we were surprised to see the skin gleam white under the application.

"Fog always has been a great cleanser when accompanied by a bit of wind. I noticed it first while a naval officer in charge of U. S. troop ships during the war. In this, the fog gun, designed by myself and in use today in Soviet Russia, the air drills the moisture to the bottom of the pores. The water sluices and the air lifts the dirt out entirely. Instead of towel we use the same fog gun, but with the water turned off. Thus, we dry our body with air." He demonstrated.

"Everything is cooked under pressure," said Mr. Fuller, pointing to a small enamel box resembling a midget refrigerator. "Rarely, if ever, is water added to the food. Terrific pressure and heat from the methane gas breaks down the structure of the food for human consumption very rapidly. There is so little use made of water in this house that a small flexible tube suffices for the entire building. The water is rain water, soft, and caught on the roof and stored in a tank in the mast until wanted.

"If you will step this way I will show you the laundry," said our guide, pointing to a small enamel machine in an alcove off the kitchen. "Clothing, too, may be cleaned by the fog gun principle. This machine launders the individual pieces, one at a time, and delivers it cleaned and dried in less than three minutes. As yet I have not been able to design an automatic presser.

"Now, if you will follow me, we will go up to the play deck." Follow him we did, up a circular staircase in the tower.

Emerging on the top structure we found ourselves walking on a solid floor suspended over the transparent ceiling of the rooms below. Just over our heads was the giant cone-like shield protecting the roof of the house. This provided shade for a 50-foot wide playground or relaxation area.

"What is the price of this house?" we asked.

"It weighs 9000 pounds," was the answer, "and may be built now without the complete standardization of parts we would obtain with quantity production, at about fifty cents per pound, or for $4,500. That, of course, includes every machine and every bit of furniture in it," he added. "Before long we will be in a position to turn them out for every pocket book, some with swimming pools and private landing fields on the upper deck for flivver planes. Then these houses will sell for about twenty-two cents per pound, or about $2,000 for this particular model. Others will sell for as high as $30,000, depending on the size and the weight of the structure and its fixtures."

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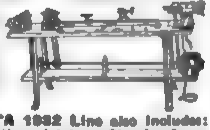

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Make This Tractor Motorcycle

(Continued from page 139)

of belting, measure up the actual length required to fit over the pulleys very tightly, and splice this belt together securely, taking care not to make lumps in it where the ends join, or your track action will be interfered with. Rivet the two sections together one on top of the other, taking care to preserve the crown of the belt so that it will ride the pulleys properly. Improper riveting of these two strips together may cause trouble and may be the cause of your tractor mechanism "running off the track."

Here, it might be wise for the reader to understand that it is possible for him to use, instead of the ordinary crown pulleys, grooved pulleys with flat sides. In that case, the belt will have to fit between the flanges of the pulleys, and there will be very little likelihood of its ever running off the track, provided it is tight enough.

Having built your main chassis, fastened it in place, so that it will pivot up and down and allow the whole tractor attachment to "caterpillar" as you strike obstructions, and having arranged your drive mechanism as shown, you are now ready to attach the treads to the track itself. As shown in the drawings, these treads are made from oak blocks as wide as possible. (This width is governed by the space which you have inside the motorcycle frame. Of course, these blocks must pass between the rear fork of the frame.)

In a majority of cases, it will be possible to make them at least 5½" wide and they should be made about 3" x 3", fastened to the canvas tread by bolts as shown. In fastening these blocks to your belt, especially if it is a belt which runs on crowned pulleys, make absolutely sure that you do not attempt to fasten it with two bolts on the edges of your belt, or the crown will be entirely gone. Fasten by two bolts directly in the center of the belt, and make sure that these bolts are filed off carefully so that they will not strike the pulley in any way.

When complete, and properly adjusted, it is possible to drive this tractor motorcycle along the highway at 25 or 30 miles an hour and to drive it up the steep sides of pastures, through sandpits, swamps, brooks, and places where the ordinary motorcycle would be hopelessly mired.

May we call your attention to the necessity of laying out your main chassis so that the motorcycle will have more ground clearance than it ever had as a stock machine. The usual ground clearance of a motorcycle is anywhere from 4½" to 5", but with the tractor tread mechanism raising the whole motorcycle rear end slightly up, you will be able to obtain more ground clearance, and this is important if you expect to traverse rough country with the machine.

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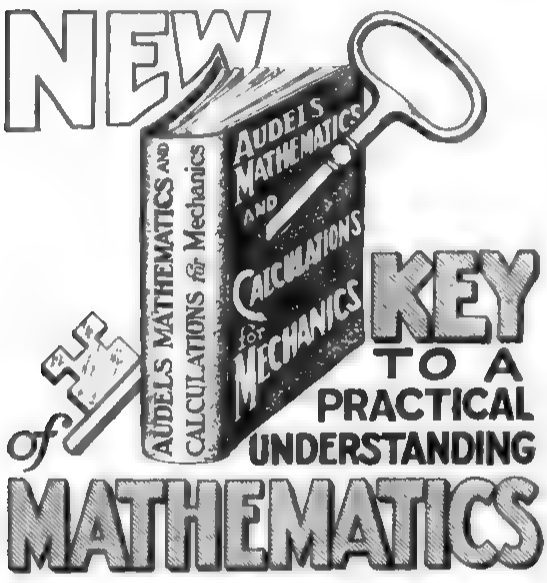

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Fortune Making Ideas for Inventors

(Continued from page 87)

Exploitation: Should be patented in all the countries of the world and sold on a royalty basis, charging so much per foot or yard of the material sold.

4. Automatic Waffle Iron

The automatic waffle irons that are now on the market are very expensive and there is plenty of room for a new one that will do the trick for about one-half the cost. We simply want an iron working on the basis of the famous click flatiron that will automatically raise the cover of the waffle iron when the waffles have been browned sufficiently. This should be easy.

Specifications: Should be so simple that the article would sell for about the same price as ordinary waffle irons sell today.

Exploitation Should be patented only in the United States and should be sold outright for a few thousand dollars.

5. A Modern Varnish Remover

What a pity that in this day and age we have to tolerate so many antiquated methods of doing things; removing varnish for instance with a putty knife and a liquid that bites the blazes out of your fingers.

Where are our inventors anyway? Heavens, this problem has been crying for a solution since Hector was a pup and yet no one has developed a really efficient varnish remover. If I don't get a decent solution to this problem from my readers I am going to be very disappointed. Come, you fellows, it is just a plain problem of pure mechanics needing only a little concentration. Get out the old pad and pencil and go to it.

Specifications: Should be made for home use and should operate from the electric light socket either by motor or electro-magnet, preferably the latter, for this would be cheaper. Should retail, if possible, for less than ten dollars and should remove varnish in one-tenth the time that is now necessary. This thing would be embraced by every paint manufacturer in the United States for anything that makes the removal of old paint and varnish easy makes the application of new paint or varnish easy.

Exploitation: Should be patented in the principal countries of the world and should be sold outright in each country, inasmuch as the unit of sale is too large to make a great deal of money by royalty.

6. Thief-Proof Light Socket

For years now the call has been going out from factories, from the manufacturers of electric light fixtures and from power houses, for a thief-proof electric light socket.

Electric lights are stolen by the millions for the simple reason that they are easy to steal. Countless millions of electric lights burn nightly without the least protection from thieves.

Is there not an inventor somewhere who can stop this loss of lights? If there is, I know where he can sell his idea so fast that it will make his head swim and he will cash in just about as beautifully as any inventor could.

Specifications: Should not cost more than ten cents to manufacturer and, once put on a light, would make it necessary to break the light before it could be removed from the socket. Naturally, the owner of the lights would have some way of removing the light and replacing it.

Exploitation: Should be patented in every country in the world and should be sold ONLY on a royalty basis. A fraction of the cost—say one cent on each article sold—would bring in many, many thousands yearly. This is one of the largest opportunities that exist for inventors today.

7. Stall-Proof Lawn Mower

Those who have cut grass with a lawn mower know how inconvenient and annoying it is to have the machine stall when tiny bits of wood, paper or stone become jammed in between the cutting blade and the revolving blades. The sudden shocks jar the blades out of adjustment very quickly, doing serious injury to the whole machine.

What is needed is either a shock-proof or a stall-proof mower and here lies a nice, neat problem in invention that will be solved some day by one of the readers of this department, I hope, because I also know that there is going to be plenty of money in the idea and I also know where it can be sold for spot cash—and a lot of spot cash at that.

Specifications: Should add but little to the cost of a mower. If possible the idea should involve a re-design of the machine so that stalling will not occur. It is also possible that some sort of a cheap attachment might be invented to overcome this difficulty. If such a device should be developed it should be made to sell for a dollar or less.

Exploitation: Should be patented in this country and the leading countries of Europe. Selling should be done on a royalty basis as should all selling involving an article that is widely used by a large number of people.

8. Electric Light That Won't Blacken

Here is a big chance for fellows who are interested in chemistry. When electric lights are burned for a time, tiny particles are shot off the filaments and are deposited on the inside surface of the glass, forming a screen that shuts off a great deal of light.

Some simple and effective method of preventing this is needed. Perhaps some young electrician or chemist will solve the problem by arranging some sort of a charged body in such a way that the particles will be deflected and prevented from finding their way to the glass surface

There are a number of ways of approaching the problem and it really is not as hopeless as it might sound. I dare say that a great sum of money would be paid for this idea.

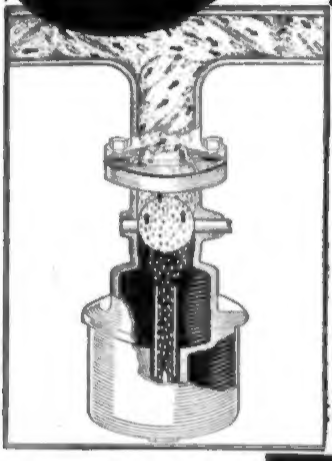
Specifications: Should add little or nothing to the cost of light and should involve perhaps some basic change in the design of the lamp itself or of the filament.

Exploitation: Should be patented in every country having at least one large manufacturer of electric lights and should be sold on a royalty basis if at all possible.

51 MILES ON A GALLON of GASOLINE WINS ECONOMY CONTEST

49 MILES Takes 2nd Place

Winning Cars Equipped With WHIRLWIND GAS SAVERS



Automobile owners who have been worrying about gasoline expense will be interested in an amazing test recently conducted by a Texas Motor Car Company. Twenty-three cars were entered in a mileage economy test, the winning car running 51 miles on a gallon of gas, the second car 49 miles on a gallon. When official test records were published it was found the two winning cars were both equipped with Whirlwind gas savers.

"Peak" Contest Mileages

The amazing results obtained in this mileage contest are naturally greater than those obtained in ordinary driving. Careful throttling, most economical speeds—no traffic hold-ups—and no waste of power thru quick stops, help to bring about these "peak" mileages.

A Test On Your Car

More power, faster pick-up, less carbon, quicker starting, and increased mileage is what users say in telling of their experience with the Whirlwind. Every motorist owes it to himself to test the Whirlwind to prove the results on his OWN CAR.

Mrs. C. P. Blalock, contest winner

How Whirlwinds Save Gasoline

The principle of the Whirlwind is to slightly compress the partly vaporized gasoline as it passes thru the raised venturi. Extra air enters from four air inlets at such a tangent as to pick up the unvaporized gasoline particles, whirling them into action. The turbulence created breaks them into a vaporized gas, giving better, smoother power, quicker starting, cutting gasoline waste and carbon formation.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the MORE YOU SAVE.

GUARANTEE

No matter what kind of a car you have or how big a gas eater it is the Whirlwind will save you money. While we do not claim to produce 49 to 51 miles on ordinary driving, we do guarantee that the Whirlwind will save its cost within 30 days or the trial will cost you nothing. We invite you to test it at our risk. You are to be the sole judge.

Car owners all over the world are amazed at the results of their tests. "I have more speed, power, and increased mileage," writes Henry Bomberger. "Hills I used to take in second I now make in high." Anton Welsch: "I wouldn't take the Whirlwind off my car for any money. I am certainly convinced." W. B. Fountain: "My mileage has increased greatly. My car has plenty of pick-up and starts like a whip."

SALESMEN AND DISTRIBUTORS WANTED

To Make Up To $100 A Week and More

Whirlwind men are making big profits taking care of local business for this fast selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

WHIRLWIND MFG. COMPANY

Dept. 880-A Station C Milwaukee, Wis.

FREE OFFER COUPON

WHIRLWIND MANUFACTURING CO.,
Dept. 880-A, Station C, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one Free. This does not obligate me in any way whatever.

NAME .....

ADDRESS .....

CITY .....*STATE* .....

☐ Check here if you are interested in full or part time salesman position.

TURNS COLD WATER INTO HOT WATER INSTANTLY!

ONLY $3.95 COMPLETE

Earn $10 to $15 DAILY

Trade-Mark Reg. U. S. Pat. Off. Pat. App. For.

Here's the biggest Money-Maker in years: Men with no experience average $9.60 daily. Scores of others earn from $30 to $40 daily from May to October. Water-Matic is a sensational summer seller. Fires are out for the season and hot water is not always available. Cash in on the naturally heavy demand. Our simple sales plan brings 7 sales from 10 demonstrations. It's easy. We show you how. 20 MILLION HOMES wired for electricity are waiting for this needed utility. Doctors, Dentists, Druggists, Garages, Stores and business places find it indispensable. Summer Camps and Cottages, Colonies can be sold on sight. If you are looking for a big pay job, take this proposition while the season is still young. Make a Year's salary during the next three months.

WATER-MATIC is giving satisfaction to thousands of housewives and business people. It's practically indispensable when once used. Snap Water-Matic on your cold water faucet, plug into a convenient electric outlet, and in 10 seconds you have hot *running water*. No need to heat a whole tankful of water when only a small quantity is wanted. It saves its own cost by lowering fuel bills. THIS MODERN MIRACLE is a blessing for preparing baby's bath, heating baby's bottle, or a hot water bag, washing dishes, lingerie and fragile items of apparel; for shaving; for sick room; for emergencies. If it were never used for anything except for emergencies it would be well worth its price. Every Water-Matic comes to you completely equipped, ready for use on either A.C. or D.C. 105-120 volt.

Get into BIG MONEY

Why half-starve on a part-time job when you can get into the BIG MONEY with WATER-MATIC! *No experience needed.* Once you see how WATERMATIC works on your own faucet, you become so enthusiastic NOTHING CAN STOP YOU!

We *show* you everything — how to demonstrate, how to close sales, collect your CASH. Start in Spare Time—10 Sales, an Evening's Easy Work, nets you $12.00 CASH IN HAND. *Full time earnings average 25 Sales a Day net you $30.00 a Day, $180.00 a Week, $780.00 a Month, More than $9,000.00 a year* Territory is Going Fast. Tomorrow May Be Too Late.

MAIL THE COUPON AT ONCE

WATER-MATIC

TO MEN DESIRING INCREASED INCOMES

Water-Matic Heater Corp.

246 Fifth Avenue, Dept. 961, New York, N. Y.

I enclose $2.75 for one complete Water-Matic Sales Outfit. I understand that I am to demonstrate Water-Matic and take orders at $3.95 each. I will collect $1.20 as my commission and send the orders to you for delivery direct to my customers C.O.D. for the balance of $2.75.

Name .....

Address .....

City ..... *State* .....

No C.O.D.'s—Please Send Postal or Express M. O.

TODAY . . . this Opportunity is YOURS

PYROIL

(Simply Add to Oil and Gas)

TOMORROW the PYROIL opportunity may have slipped through your fingers. Territories are fast being clinched. To date, thousands of men who grasped PYROIL a few short months ago, have cut their niche in the wall of fortune and are now reaping profits tremendously in excess of their fondest hopes.

START as SMALL as YOU WISH

It requires no big investment to start with PYROIL. Test the sale of two cans or a hundred. You can pyramid your profits and set yourself up in one of the biggest profit paying businesses of the present day in almost no time at all!

The spectacular rise and present intense sales demand of this now famous product is sufficient to command the admiration of any true, red-blooded salesman and stir him to immediate action. (See Saturday Evening Post, Pyroil column advertisement, July 23rd, 1932.)

Why don't *you* clip the coupon in the corner and find out what it's all about—what you're missing—what financial success *you*, too, can have!

PYROIL COMPANY
W. V. Kidder, President
692 Pyroil Bldg. La Crosse, Wisconsin

Genuine PYROIL is identified by the winged PYROIL trademark and signature of W. V. Kidder, on every label.

President

PYROIL'S LATEST FEAT!

For the first time in history, on June 5, 1932, at Winona, Minnesota, Airport — before official witnesses and hundreds of spectators — an airplane (*which had been previously treated with PYROIL*), was successfully flown *with perfect results and no damage*, for 35 consecutive minutes, *with absolutely no oil in the crankcase!* This amazing performance was executed to prove the extra safety factor in lubrication added by PYROIL.

Scores of other equally amazing accomplishments.

PYROIL is acknowledged one of the greatest lubricating developments of modern times. Used and endorsed by the greatest industries of the world and multitudes of individuals. *Builds lubrication into the metal.*

Mr. W. V. Kidder, Pres., Pyroil Company,
692 Pyroil Bldg., La Crosse, Wisconsin.
Dear Sir:
Please send me the facts and indisputable proof of PYROIL—what it is accomplishing and the success waiting for me as a representative.

Name .....

Address .....

City .....

County ..... State.....

A Blessing in "Hard Times"

New Soles 9¢ A PAIR

as low as

FREE SAMPLE SAVASOLE

To Readers of Modern Mechanix

See this amazing new discovery that ends shoe repair bills—makes buying new shoes unnecessary. It's called SAVASOLE—a scientific plastic material which spreads on worn soles and heels like spreading butter on bread. Hardens overnight. Makes "worn-out" shoes like new—makes them wear for months and months. Cost of half soles with Savasole as low as 9c a pair. The plastic material fills in all cuts, holes, cracks, forming a smooth, flexible, waterproof, non-skid surface. A patch for a penny, or a new half sole for a few cents. Agents and distributors CLEANING UP with this sensational "hard times" specialty. New low price means EVERYBODY buys. Mail coupon NOW for Free Sample on leather and big money-making agents' offer. Learn how YOU can earn up to $42 A DAY with Savasole.

Pays Agents UP TO $42 A DAY

DRIES HARD and Smooth Overnight

No more taking shoes to the cobbler. No paying from $1.00 to $1.75 for leather or rubber soles and heels. No more pegs, nails, or stitches to hurt the feet. No more shoes pulled out of shape by stiff leather half soles. No more buying new shoes. Just spread SAVASOLE on the worn-out soles and heels or merely patch the worn spots. Let it dry overnight. In the morning you have a new wearing surface that is hard, smooth and durable. Flexible—comfortable—will not "draw" the feet. Wears like leather and is absolutely waterproof. CANNOT COME OFF. Your satisfaction is GUARANTEED.

1001 Uses Savasole is splendid for repairing auto tires, auto tops, boots, rubbers, gloves, galoshes, harness, leather belts, canvas, tarpaulins, sporting goods, garden hose, leather furniture—anything made of leather, rubber or cloth can be easily and cheaply repaired or resurfaced with Savasole.

AGENTS BREAKING PROFIT RECORDS!

Naturally, everybody is a customer for this amazing invention, which has scores of uses in EVERY household. Big margin of profit on quick, easy sales. Lewis sold over $20,000 worth of Savasole. Kimura just got $500 Cash Bonus IN ADDITION to his splendid earnings. Elford buys in 10-gross lots. Morrill, Pitt, Baker and scores of others earning more money than they ever made before. Schools, police departments, state and city governments—all kinds of institutions buy in big quantities from Savasole distributors. Savasole is a marvelous "hard times" item. The poorer people are the more they need to SAVE money. And every set of SAVASOLE saves from $5.00 to $50.00 in repairs and new purchases.

ACT AT ONCE

Desirable territories are being "snapped up" by hustlers. Plenty of good territories still open. Get yours NOW! We show you how to make quick convincing demonstrations that amaze customers and get the orders. Every family needs Savasole. Repeat business everywhere. Rush coupon now for Free Sample on leather and special starting offer.

SAVASOLE

The Original Perfected "Plastic"

BEFORE. Here is an old shoe, worn down, ready to be sent to the shoemaker, who would charge $1.00 to $1.75 for a first-class job.

AFTER. Here is the same shoe repaired with SAVASOLE. No hammer, nails, or pegs. Just use an old knife. All the cracks and breaks are filled in and covered up with a hard, smooth, waterproof, non-skid surface. SAVASOLE repairs shoes for one-tenth the cost of ordinary heels and soles.

MAIL FOR FREE SAMPLE

R. R. Bollman, Pres., Savasole Company,
J-41 Daylight Bldg., Cincinnati, Ohio

Dear Mr. Bollman: Please send me FREE Sample of SAVASOLE on leather, your starting offer and explain how I can earn up to $42 on your exclusive territory plan. Send everything FREE and without obligation.

NAME .....

ADDRESS .....

CITY ..... STATE .....

TERRITORY PREFERRED .....

SAVASOLE COMPANY

J-41 Daylight Building CINCINNATI, OHIO